MINING WORLD

AUGUST 1960

Stripping

new Mission copper pit in Arizona gets off to a fast start ▶ 26

Missouri Exploration for lead and iron centers south of Viburnum; 12 major companies active . . . ▶ 22

Philippine's new copper prospect may develop into important mining operation . . . ▶ 28

How Reversed Siesmic Profiles provide better rippability factors . . . ▶ 30

Rhodesian Copperbelt mining methods and expansion plans; another Special Correspondent report . . . ▶ 32

Kiruna Finds Injekto Grouting Best method for cementing rock bolts. Chemicals added for quick setting ▶ 36

Thomas A. Edison:
His developments in electricity made possible modern mass production and automation.

"Imagination... is the source of human improvement; experience its implement"

Modern automation control in this WKE-built plant enables maximum operating efficiency and economy.

AUTOMATION: ENGINEERING FOR OPTIMUM EFFICIENCY AND PROFITS

Automation should be applied only where it effects optimum use of manpower and equipment for maximum plant output per dollar of cost. This kind of automation calls for the application of broad engineering experience, knowledge and capability. Some typical WKE engineered jobs include:

- *Vulcan Materials Company* (limestone quarry and rock plant) near Chicago. Two men control an entire 1,500 tons-per-hour operation including *exact* blending of eight rock sizes to meet a variety of finished product specifications.
- *Fibreboard Paper Products Corporation* (wallboard plant) at Florence, Colorado. Automatic blending and temperature controls plus *exact* governing of the "board" machine, guarantee a quality, specification product.
- *Kennecott Copper Corporation* (the United States' newest smelter) in Arizona, incorporates varying degrees of automation, including a one-man operated "control center" which audibly and visually signals and records any problem condition.
- *Phillips Petroleum Company* (1,750 tons-per-day Uranium extraction plant) at Grants, New Mexico. The most modern concept of instrumentation and electrical design insures maximum extraction and close control of Uranium Oxide to meet Atomic Energy Commission requirements.

To the men of WKE, automation is a modern tool which should be engineered to the limits of its practical, economical application to bring about maximum levels of production within established budgets. We would like to share our experience and ability with you.

PROJECT DESIGN • ENGINEERING • CONSTRUCTION

WKE®

WESTERN-KNAPP ENGINEERING CO.
SAN FRANCISCO • New York • Chicago • Hibbing

Building for the Future—in a World of Industries

Eliminate corrosion...

for lower drilling cost...

with **SANDVIK Coromant** *SR-Treated Integral Steels!*

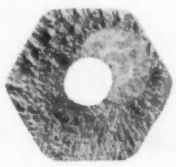
- Corrosion promotes breakage: You know, of course, the variety of mechanical stresses to which steels are subjected in work. Stresses cause fatigue; can cause premature rod breakage, before the normal tensile strength or even the yield point has been exceeded.

  In most cases, fatigue failure starts from the point where corrosion has set in. In other words, corrosion sets up the conditions for a fatigue break to occur. Except—when you use Sandvik Coromant Integral Steels! The exclusive Sandvik SR-treatment* protects against corrosion and provides from 30 to 50% longer life than untreated steels.

  You get other advantages too: Less loss of energy, since the bit is integral with the steel. There is no bit to "get lost". What's more, since Sandvik is one of the world's largest manufacturers of tungsten carbide, you get bigger and better inserts.

  Sandvik Coromant Integral Steels are available from 1" to 1¾" bit diameter, in ¾", ⅞", and 1" hexagonal steel section.

  Write today for complete information. Address: Dept. MW-15.



Appearance of a fatigue breakage that often arises with rods that have not been protected against corrosion. Sandvik's SR-treatment* protects against such failures.

*pat. pend.

PROGRESS THROUGH BETTER TECHNOLOGY

BLUE RIBBON MINING AWARD 1960

Atlas Copco

545 Fifth Avenue, New York 17, N.Y.

610 Industrial Avenue
Paramus, New Jersey
COlfax 1-6800

930 Brittan Avenue
San Carlos, California
LYtell 1-0375

weather . . . bad
DW21 . . . going where the going's tough
job . . . overburden stripping on schedule

Job—1,200,000 yards of clay, sand and lignite to be moved in 6 months. Working 12 miles southwest of Little Rock, Arkansas, Dulin & Co., Inc. stripped overburden 55′ deep for a bauxite mine. Heavy rains made haul roads slippery . . . load and dump areas mucky.

But the job was completed on schedule. Five DW21s and 470B Scrapers moved 10,000 cu. yd. per 20-hour day. They carried 16 bank cu. yd. on a 3600′ cycle.

Here's what Superintendent Clyde Moore has to say about the DW21s: "We're a 100% Cat-equipped company. The new DW21 is the best hauler we've ever used. It's got lots of speed and traction. It goes through mud that's tough for track-type tractors."

This is the kind of performance you can expect from the new DW21G. Its 345 HP diesel delivers 12% more rimpull which provides up to 20% faster speeds than the former models over similar haul conditions. To handle this increased horsepower, the DW21 has stronger final drive gears and improved transmission shifter forks. The matching 470B LOWBOWL Scraper has greater capacity . . . 19.5 cu. yd. struck . . . 27 cu. yd. heaped. Stronger bowl, draft frame and apron result in longer service life, less maintenance.

The new DW21 is geared for today's highly competitive market. It's a high-capacity rig designed to move more dirt at a lower cost.

Pick your toughest job. Then pick up your phone and call your Caterpillar Dealer. Ask him to demonstrate the heavy-duty, profit-making DW21.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

**WANTED—
THE HARD WORK**

MINING WORLD

. . . . . including the Export Edition, WORLD MINING

VOL. 22 No. 9 August 1960

Major Ore Discoveries in Missouri are result of drilling the Bonneterre formation in proximity to buried Pre Cambrian knobs and ridges. Aeromagnetic survey gave clues to bedrock surface and indicated magnetic deposits in bedrock 22

Congo's New Minister of Mines represented the nation on the recent International Tin Council meeting. An exclusive report on the Minister's background 25

Mission Stripping gets off to a fast start as American Smelting and Refining Company prepares new copper mine in Arizona for production. Now shovel-truck stripping 2,500,000 tons per month 26

Philippine copper discovery on east coast of Luzon may make an important new mine. Acoje Mining Company, Inc. speeds exploration in remote jungle area 28

Reversed Seismic Profiles provide better rippability factor by compensating for dip of bedrock and surface slope. This is a refinement of method developed by Caterpillar 30

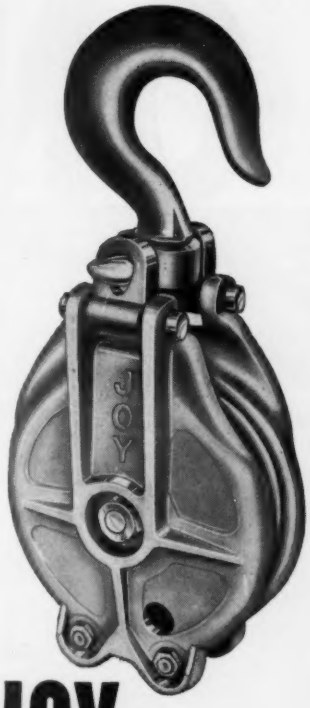
Geology and Mining Methods on the Northern Rhodesian Copperbelt. Epigenetic theory of mineralization gains ground. Sub level and caving methods used for wide steeply dipping lodes 32

Kiruna Cements all rock bolts by injekto method at its large Swedish iron mine. Any of several grouts with cement and chemicals are used to anchor deformed bars as rock bolts 36

WHAT'S GOING ON IN MINING

DEPARTMENTS

mf MILLER FREEMAN PUBLICATIONS



JOY quick opening SHEAVE BLOCKS

forged construction

The hook and side plates of the 6", 8" and 10" sizes are *forged alloy steel*. The wheel is chrome-nickel-moly cast steel. All parts are heat-treated for strength and wear resistance.

simple & rugged

There are no pins, chains, bolts or nuts to handle or remove. TO OPEN JUST TURN AND PUSH . . . no parts leave the block to become lost. The rugged opening mechanism will last for the life of the block.

Write for Bulletin 287-8

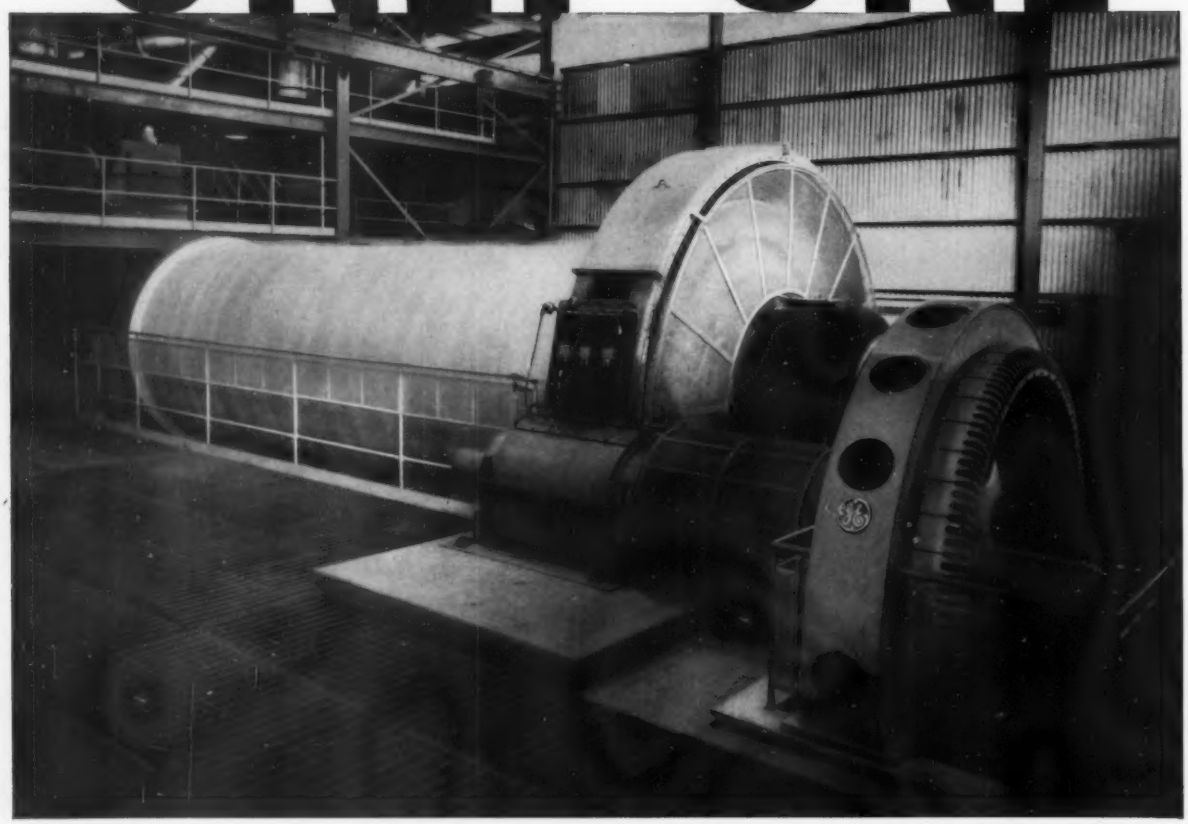
JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

MINING WORLD, August, 1960. Volume 22, No. 9. Published monthly except April, when publication is semi-monthly at Emmett St., Bristol, Conn. Executive, advertising and editorial offices, 500 Howard Street, San Francisco 5, California. Subscription in United States, North Central and South America, $4.00 per year; other countries, $5.00 per year. Entered as second class matter Oct. 10, 1951 at the Post Office at Bristol, Conn., under act of March 3, 1879. Postmaster, please send notice 3579 to MINING WORLD, 500 Howard Street, San Francibco 5, Calif.

ONLY ONE



ONLY ONE TYPE AND SIZE FINISHING MILL WILL DO THE BEST JOB IN YOUR PLANT. THAT'S THE MILL TRAYLOR WILL BUILD FOR YOU

From requirements outlined by Standard Lime and Cement Company, Traylor engineers built this 10′ x 32′ two compartment ball mill for installation at Martinsburg, West Virginia. Write today and tell us the size product and capacity needed for a grinding mill in your plant. Our engineers, expert in this field, will recommend the mill Traylor-made specifically to fill your requirements most efficiently . . . most economically.

Visit Traylor Booth 211 at the Mining Show

TRAYLOR ENGINEERING & MANUFACTURING
DIVISION OF FULLER COMPANY
1550 MILL ST., ALLENTOWN, PA.

TMA 1

MINING WORLD

EDITORIAL AND EXECUTIVE OFFICES

500 Howard Street
San Francisco 5, California
EXbrook 7-1881

Sales Manager ..... H. G. Grundstedt
Editor ..... George O. Argall, Jr.
Field Editor ..... John R. Bogert
News Editor ..... Janet M. Taylor
Product Editor ..... Suzanne Matsen
Production Manager ..... Janet M. Taylor
Circulation Manager ..... C. C. Baake
Field Circulation Mgr. ..... C. S. Denny

New York City Office
370 Lexington Avenue
New York 17, New York
Murray Hill 3-9295
District Manager ..... Stanley H. Dayton

Director, International Operations .....
Ralph R. David

Chicago Office
1791 Howard Street
Chicago 26, Illinois
Rogers Park 4-3420
District Manager ..... Norman C. Ek

Vancouver, B. C. Office
402 Pender St. West
Vancouver, British Columbia, Canada
MUtual 5-7287
Cable Address: MILFREEPUB
Associate Editor ..... Charles L. Shaw

United Kingdom Office
130 Crawford Street
(Corner Baker Street)
London, W. 1, England
WElbeck 3624
Cable Address: MILFREEPUB
Manager, United Kingdom Office .....
Bernard W. Lansdowne
Advertisement Manager ... Derek Hopkins

Continental European Office
28 Attendorner Street
Köln-Merheim
West Germany
Telephone: 87-17-52
Cable Address: MILFREEPUB
Director, Continental European Operations
Dr. Walter F. Vogeno

STAFF CORRESPONDENTS: Africa—Johannesburg, Union of South Africa; Salisbury, Southern Rhodesia; Luanshya, Northern Rhodesia; Kampala, Uganda. Asia—Ankara, Turkey; Kuala Lumpur, Malaya; Bombay, India; Tavoy, Burma; Karachi, Pakistan; Seoul, Republic of Korea; Tokyo, Japan. Europe—London and Redruth, England; Vienna, Austria; Stockholm, Sweden; Trondheim, Norway; Paris, France; Madrid, Spain; Köln-Kalk (Cologne), West Germany; Rome, Italy. North and Central America—Vancouver, British Columbia; Mexico, D.F., Mexico. Oceania—Port Kembla, Australia; Manila, Republic of the Philippines; Bandung, Indonesia. South America—Lima, Peru; La Paz, Bolivia; Buenos Aires, Argentina; Santiago, Chile; La Serena, Chile.

Not responsible for unsolicited manuscripts. Contents may not be reproduced without permission.

Published by Miller Freeman Publications
Wm. B. Freeman, President
Miller Freeman, Jr., Exec. Vice-President & Treas.

SUBSCRIPTION RATES:
U.S., North, South and Central America $4.00
Other Countries $5.00
Single Copies .....$. 50
Directory Number $1.00

CHANGE OF ADDRESS:
Send subscription orders and changes of address to MINING WORLD, 500 Howard St., San Francisco 5, Calif. Include both old and new addresses and zone numbers.

Copyright 1960 by Miller Freeman Publications Incorporated

Meet These Challenges

The friendly Filipinos of the mineral-rich Philippine Islands are the staunchest friends and supporters of the United States.

Americans—particularly American mining and metallurgical engineers—over the last 60 years have done much to discover, develop, and produce a wide variety of minerals and metals. They have had an important part in creating this friendship.

The mining industry in the Islands is led by a small, but highly skilled, group of American engineers. They are a vital segment of the mining industry today which is being financed by Filipinos on an ever-growing scale.

The Philippine government, the United States government, the mining companies of both countries, and the mining colleges of the United States all have a most important part in maintaining the close friendship of the two nations, the production of minerals, the opportunities for engineers of both countries, and the sale of United States equipment.

Here is a challenge to government—to foster a more favorable investment climate in the Islands.

That's not enough. There must be a greater exchange of technical skills and education of young Filipino engineers.

Here is a challenge for mining companies of both nations. Arrange engineering exchange visits. A flotation specialist from Arizona would work in one of the copper mills in the Philippines. His counterpart would work in Arizona. Their respective employers would continue to pay their salaries. The same could apply to mining engineers and geologists.

All engineers would learn new methods, new ways of prospecting and operation. These added skills would be of great value to their employers.

When I was a student at the Colorado School of Mines, there were 17 Filipino students. Today these engineers fill important operational and managerial positions in mining and other industries in the Philippines. They are the core of trained engineers in the Islands. There are no Filipino student engineers now at the Colorado School of Mines. With independence, the Islands lost their preferred scholarship position.

Here is a challenge to the Colorado School of Mines—and other mining colleges, too. Award scholarships to qualified Filipinos. They did and they will pay all their transportation and living expenses. The financial boost the scholarship would afford would be just the amount needed to permit carefully selected and well qualified students to again study mining engineering in the United States.

The Philippine mining industry, so long a branch of the United States mining industry, is expanding. The challenge is to expand it in the established pattern—not to let it wither, not to let it become an Oriental satellite.

Here is the challenge for all. Maintain the Philippines as the brightest Oriental star.

G. O. A., Jr.

NICO

. . . setting the pace in

Material Conveying Equipment

NICO **Apron Feeders**

NICO **Apron Conveyors**

NICO **Bucket Conveyors**

NICO **Bucket Elevators**

NICO **Reciprocating Feeders**

NICO **Hydrastroke Feeders**

NICO **Hi-Torque Reducers**

The only basic design changes in feeders in the past generation.

Learn the benefits of Modern Design . . .

Engineering Catalog 59-A (just released) tells the complete NICO Conveying story. Photos, detailed drawings, diagrams, together with engineering data and specifications make it an invaluable reference in determining the right feeder or conveyor. Ask your NICO representative or write direct for your copy.

NATIONAL IRON COMPANY

Subsidiary of Pettibone Mulliken Corp., Chicago 51, Illinois

50th Avenue West and Ramsey Street **Duluth 7, Minnesota**

CAPITOL concentrates

GOVERNMENT ACTION AND REACTION AFFECTING MINING

Edmondson Lead-Zinc Bill Waits Senate Action In August . . .

In the face of opposition by the Administration and much to the astonishment of many legislative experts, the House of Representatives passed the Edmondson small lead-zinc mine subsidy bill by the narrow margin of five votes—197 to 192. An attempt to pass the bill on the Senate unanimous consent calendar was defeated, so the bill goes over until August for general debate.

Although the Senate Interior Committee had reported the bill without amendments, Senator Allott of Colorado introduced an elaborate series of amendments on the Senate Floor and these will have to be debated.

As passed by the House and reported by the Senate Interior Committee, the bill seems to have some serious deficiencies. A mine, to be eligible for payments, must have produced at some time during the past seven years and payments may not be made to a mine which produces more than 2,000 tons of lead and/or 2,000 tons of zinc per year. These provisions will prohibit opening up new properties or old properties in order to get the subsidy and they might induce some mines to cut back in order to qualify for the subsidies.

Also, the bill carries a limit on appropriations of $4,840,000 per year for administration and subsidies. Perhaps this might be all right if prices remain the same as they now are, or improve, but should there be a sudden and considerable drop in prices (and abrupt swings in metal prices have always plagued the mining industry) there might not be enough money provided to carry through the year. The Senate Interior Committee in its report recognized this possibility and tried to cure it by instructing the Secretary of the Interior to prorate the funds in case of an unusual drop in prices.

Such a statement in a report does not have the force of law when the bill itself is clear that the payments shall be the difference between the market price and 17 cents per pound for lead and the difference between the market price and 14.5 cents per pound for zinc. Under these circumstances it would seem hazardous to start up a property, although someone who merely has cut back an already operating mine to meet the requirements would not be badly off. The act would run until 1965.

The Allott amendments seem to make the bill more sensible, although the quantities eligible are reduced to 2,000 tons of combined lead and zinc per year and the prices are reduced to 15.5 cents per pound for lead and 13.5 cents for zinc. A floor is put under payments and a $50,000,000 revolving fund is to be set up by selling Treasury notes. Also, all producers would be eligible.

These amendments will cause a good deal of debate. If any are adopted, the bill will have to go to conference, and that could mean that the bill might be lost entirely. ■

Four-Year Exploration Limitation Is Removed . . .

President Eisenhower has signed into law H. R. 4251, the measure which relaxes the rules governing tax write-offs for exploration expenditures.

The new law removes the four-year limitation on the deductability of these exploration expenditures, but retains the $400,000 over-all limitation and the $100,000 yearly limit.

The Treasury Department had opposed passage of the legislation, contending that it would result in a substantial loss of revenue. It also was argued that the new tax benefits would go largely to the established mining concerns, rather than to new operators, and that the mining industry already enjoyed considerable federal assistance through the mineral exploration program and subsidies. One of the chief arguments advanced for the legislation was that large mining operators can claim the entire $400,000 tax write-off, but that the four-year limitation discriminated against smaller operators. ■

Emergency Plan For Minerals And Fuels . . .

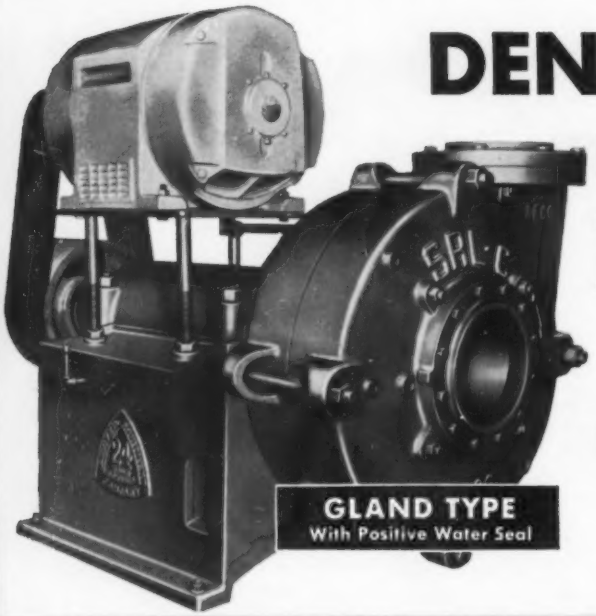
A plan for mobilization of the nation's minerals and fuels industries in the event of a national emergency has been outlined by the Office of Civil and Defense Mobilization. A major objective of the plan—the National Energy and Minerals Plan—is the development of nationwide stand-by organizations to exercise national direction and control over the operations of electric power, petroleum and gas, solid fuels, and minerals industries and their facilities under nuclear attack conditions.

In case of a general war, the Department of the Interior, under the policy direction of OCDM, would direct and control all phases of the production of solid fuels and coal chemicals and would take over distribution of all fuel stocks. Coordinating committees would be set up on a state and local basis to operate as advisory groups in an emergency.

Because of the existence of large stocks of mineral raw materials both in the national stockpile and those customarily maintained by mineral-processing and consuming plants, OCDM anticipates that "the need for production, processing and delivery of minerals would come primarily after the survival period had passed—when industrial production is being progressively restored and reconstruction is under way." According to OCDM Director Hoegh, state and

DENVER SRL PUMPS

Now available in TWO Models



FOR AN EVEN WIDER RANGE OF PUMPING APPLICATIONS

AVAILABLE IN THESE SIZES AND CAPACITIES

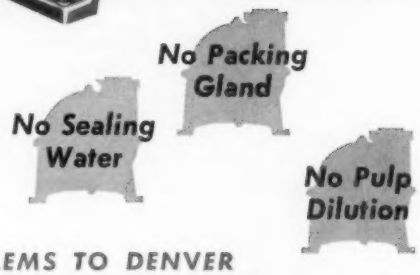
Specifications and Dimensions

Pump Size and Type	Capacity 60' Head RPM	HP	*Water GPM	Dimensions (In.) L	W	H	Approx. Ship. Wt. Lbs.
GLAND TYPE							
1½"x1¼"	2190	1.9	40	25	17½	26	525
2½"x2"	1500	4.9	160	25½	17½	26⅜	575
3" x3"	1400	6.8	260	31¼	19¾	31½	850
5" x5"	1060	17.4	800	37¾	26¼	36½	1550
6" x6"	1170	36.3	1600	45¼	28½	46½	2300
3" x3"—C	1450	8.2	260	37½	21½	33¾	1240
5" x4"—C	1035	12.6	700	40¼	27	37⅜	1600
8" x6"—C	920	39.8	1600	63	36½	49¼	4375
10" x8"—C	820	74.0	3300	68¾	43	57	5100
12" x10"—C	615	115.0	5000	69⅝	46½	63	5900
GLANDLESS TYPE							
3" x3"—C	1450	10.0	180	37½	21½	33¾	1240
5" x4"—C	1035	15.0	500	40¼	27	37⅜	1600
8" x6"—C	920	47.0	1200	63	36½	49¼	4375
10" x8"—C	820	87.0	2700	68¾	43	57	5100

*Based on water. Multiply horsepower by specific gravity of pulp to obtain actual brake horsepower.

DENVER "TRU-GLANDLESS" SRL PUMP... A MAJOR ADVANCE IN PUMP DESIGN

DENVER SRL Pumps with positive water seal already have a world-wide reputation for their high efficiency, low part cost, long life. If dilution of pulp or slurry is a problem, you now get the extra advantage of "TRU-GLANDLESS" construction. Requires no sealing water, no packing glands, eliminates pulp dilution.



SEND DETAILS OF YOUR PUMPING PROBLEMS TO DENVER

Complete Mineral Processing Equipment

"The firm that makes its friends happier, healthier and wealthier"

DECO ENGINEERS — STANDARD RELIABLE EFFICIENT — 24 HOUR SERVICE

DENVER EQUIPMENT COMPANY

Cable DECO DENVER — Phone CHerry 4-4466

1400 Seventeenth St. — Denver 17, Colorado

- **NEW YORK CITY** 4114 Empire State Bldg. Phone CH 4-6510
- **BLUEFIELD, W. VA.** P.O. Box 1536 • Phone DAvenport 5-6598
- **TUCSON, ARIZ.** 3437 E. Camden St. • Phone EAst 6-7282
- **LONDON** 15-17 Christopher St., Finsbury Sq. Phone Bishopsgate 3575
- **JOHANNESBURG** Broadway and Ninth Bez Valley • Phone 25-7531
- **TORONTO** 185 Bay Street Phone EMpire 3-3836
- **VANCOUVER** 802 Credit Foncier Bldg. Phone MU [illegible] 95
- **MEXICO City** Avenida Juarez 14, Desp. 615 Phone 21-1477
- **LIMA** Marquinarias 270 Casilla 4950 • Phone 41887

local governments should include, in their planning, arrangements with the mining industry for the temporary use of equipment and manpower in civil defense operations, being careful to provide for retention of adequate equipment and manpower to maintain the mines in safe and operable conditions. ■

Definition Applies To Percentage Depletion . . .

The Gore amendment to the Debt Limit and Tax Extension Act, which amendment defines the point in processing to which the application of percentage depletion shall extend, was passed by the Senate.

The Treasury Department has had considerable difficulty with interpretations and numerous cases of percentage depletion have gone to the courts. The Gore amendment was designed to establish specific guide lines and in that way avoid future litigation. While the bill was held in conference committee to adjust the differences in provisions contained in the House and Senate versions, the Gore amendment was substantially rewritten to eliminate some of the features objected to and to include some provisions advocated by the mining industry. In its revised form the bill was passed by the House and Senate, then signed by President Eisenhower on June 30.

In the future, the mining industry will be allowed to include in the depletion base those processes considered as mining and specifically described in the law, plus processes "necessary or incidental" thereto. The measure is effective with respect to taxable years beginning after 1960. ■

Multiple-Use Principle Becomes Law . . .

President Eisenhower has signed the multiple-use bill, H. R. 10572, which states that multiple use of public lands is an official policy of the Congress.

The measure is a directive to the Secretary of Agriculture to administer the national forests for multiple use and sustained yield. It lists the multiple uses to which public lands shall be put, naming recreation, hunting and fishing, grazing, timber, and watershed management. It carries the statement that nothing in the measure shall be construed to affect the authority of the Secretary of the Interior with respect to mineral resources or the National Park Service. The Multiple Use Act must not be confused with the Wilderness Bill. ■

New Rules Issued On Land Exchanges . . .

New regulations designed to make it more difficult for "speculators" to profit from the exchanges of private lands for federal lands have been drafted by the Department of Interior. The regulations were published in the Federal Register on June 16, and 30 days allowed for comments.

Under the new rules, persons seeking to exchange private land for government tracts would be required to furnish proof of title to the lands they offer in exchange. Present rules permit individuals to offer lands held under option on purchase agreements which were contingent upon government approval. ■

COMING CONVENTIONS

August 15 through 25. WORLD GEOLOGICAL CONFERENCE, Copenhagen, Denmark.

September 26 through 30. INSTRUMENT AUTOMATION CONFERENCE & EXHIBIT and the 15th Annual Meeting of the Instrument Society of America, New York, N.Y.

October 5, 6, and 7. Sixth annual ROCKY MOUNTAIN MINERAL CONFERENCE, Newhouse Hotel, Salt Lake City, Utah.

October 10 through 13. METAL MINING SHOW sponsored by the American Mining Congress, Convention Center, Las Vegas, Nevada.

October 17 through 18. Biennial Symposium on DRILLING AND BLASTING, at Golden, Colorado, sponsored by mining departments of University of Minnesota, Pennsylvania State University, and Colorado School of Mines.

October 17 through 21. NATIONAL METAL CONGRESS AND EXPOSITION, Trade and Convention Center, Philadelphia, Pennsylvania.

November 3, 4, and 5. Annual meeting of the NEW MEXICO MINING ASSOCIATION and the SOUTHWEST MINING ASSOCIATION, La Fonda Hotel, Santa Fe, New Mexico.

1961

February 22 through 25. INTERNATIONAL SYMPOSIUM ON MINING RESEARCH sponsored by the U. S. Bureau of Mines and Missouri School of Mines and Metallurgy, Rolla, Missouri.

April and May. Seventh COMMONWEALTH MINING AND METALLURGICAL CONGRESS. Opening on April 10 in Johannesburg with four week tours in the Union of South Africa and one week each in Northern and Southern Rhodesia.

April 12 through 14. Symposium on AGGLOMERATION, sponsored by the AIME. Sheraton Hotel, Philadelphia, Pennsylvania.

MAGMA

COPPER COMPANY

Buyers of

COPPER, GOLD

AND SILVER ORES

MINES AND SMELTER AT

SUPERIOR, ARIZONA

Even moving a blade-full of shot-rock around the curve, there's no hesitation, no sluing to spill the load. The TD-25's operator has separate speed control of each track to get full-capacity performance, full time. And only the new TD-25 has the power plus of the direct-start, turbocharged DT-817 International engine—that delivers 230 high-torque hp!

HOW POWER-STEERED, POWER-SHIFTED . . . TD-25 takes

—on California mining operation

Even before all the blast dust has settled, this International TD-25 is slamming tons of shot-rock from the benches, so trucks can resume hauling to the processing plant. Then, at this gypsum mine in California, the "25" takes over the "shovel-feeding" chore—dozing full blades of rock upgrade, downgrade, and 'round the curves, to help keep the big dippers swinging full. And in between times, the "25" takes over its third tough project: benching new haul road around mountain slopes!

Three slam-bang rock operations to handle—it's a made-to-order situation for the Planet Power-steered TD-25!

"Dead-track drag" eliminated! You don't brake a track and "half-kill" your pull-power to turn, as you do with king-sized clutch-steered crawlers. With Planet Power-steering you simply change the speed of one TD-25 track—on-the-go, and with 2-finger ease! Around comes the fully-loaded TD-25—with "live" power on both tracks and both tracks pulling. Load-limiting "dead-track drag" is eliminated!

And combined, on-the-go Hi-Lo power-shifting lets you match power to load, instantly—forward or reverse. Just shift one track to high range—the other to low—to do slope-hugging, full-bite benching, or to operate straight ahead with off-center loads!

The "25" is platformed on new 7-roller tracks with double-box-beam frames. The design provides super undercarriage strength for slam-bang conditions—strength to match the full effort of the direct-start, high-torque DT-817 International Diesel engine.

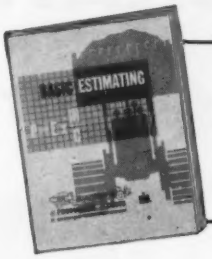
Power-steer and power-shift the TD-25 with king-sized loads. Measure the bonus capacity you get with exclusive Planet Power-steering and Hi-Lo power-shifting. See how this control combination enables you to outearn other big rigs up to 50%. Then measure what it means to get this double-barreled advantage *only* in the TD-25—and as standard equipment *to boot!* Let your International Construction Equipment Distributor demonstrate.

International Harvester Co.
180 North Michigan Ave.
Chicago 1, Illinois

A COMPLETE POWER PACKAGE

International® Construction Equipment

"Boulder-dozing" after blasting— The TD-25 does some "blasting" itself to move "big-as-a-house" hunks of rock aside. Heavy-duty TD-25 Dura-Rollers defy the rock-dozing "grind"—with the industry's thickest shells to prevent flexing—positive grit exclusion—and 1,000-hr.-interval lube capacity!



Here's your 76-page cost and production estimating book—newest, most authentic and complete guide for estimating material-moving costs—and for selecting equipment combinations for top profits, *anywhere!* See your International Construction Equipment Distributor!

over three slam-bang rock jobs

NEW POWER-CRATER Engine joins A-C line

G-138

39 bhp at 1800 rpm

The 4-cycle, 4-cylinder G-138 is available as an engine assembly or in open or enclosed power units — equipped to fit *your* particular job.

Like other engines in the Allis-Chalmers line, the new G-138 is *tough* and *economical*. It's tough because it was built for demanding tractor service. One look at its rugged construction convinces you it will do your job *better*.

Mass production makes the G-138 economical to buy — advanced short-stroke design makes this POWER-CRATER engine economical to run. Exclusive Allis-Chalmers combustion chamber, with crater-shaped pistons, controls combustion for big-power output as well as excellent fuel economy. Advantages like wet-type cylinder liners make for low-cost, easy maintenance. Parts and service are close by at thousands of Allis-Chalmers dealers.

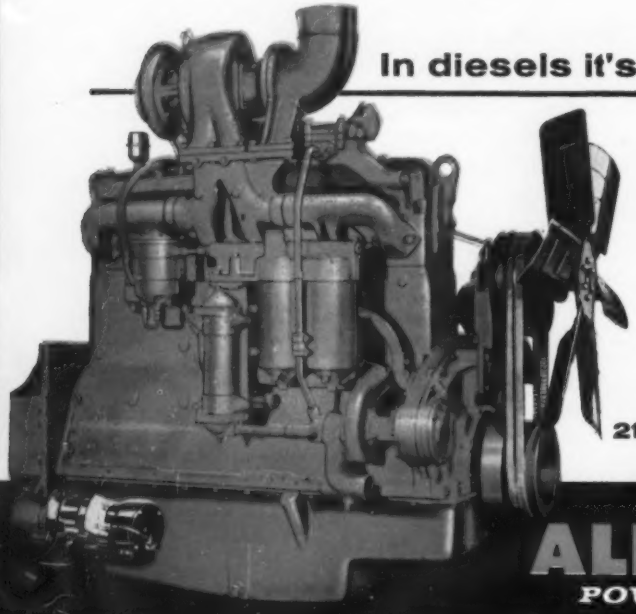
Put new PEP* into *your* jobs. Arrange today to have one of these tough, economical engines go to work making more money for *you*. Allis-Chalmers, Milwaukee 1, Wisconsin.

***Packages of Economical Power**

	G-138	G-149	G-226
Displacement, Cu In	138	149	226
Maximum horsepower (gasoline)	39@ 1800 rpm	45@ 2000 rpm	67@ 1800 rpm

POWER-CRATER is an Allis-Chalmers trademark

In diesels it's the PERFORMANCE PROVED 21000 and 16000



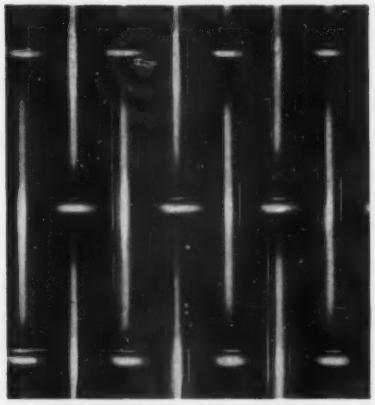
The amazing 21000 and 16000 diesels are exceeding expectations wherever they are used. The turbocharged 21000 uses *8 to 27 percent less fuel* than any other engine in its class — and has stamina to match! Torque is consistently high, acceleration is immediate. Starting is fast, too, even at sub-freezing temperatures and without starting aids. Find out more about these and other diesels in the Allis-Chalmers line — various models and sizes to 516 hp.

21000 diesel 340 hp

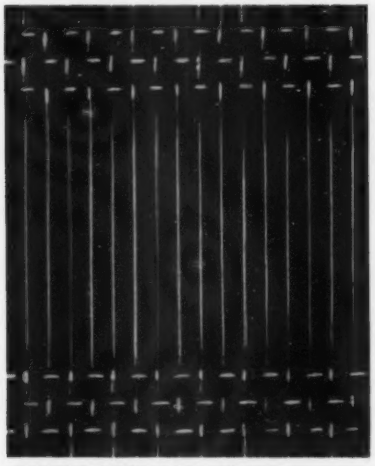
BE-21

ALLIS-CHALMERS

POWER FOR A GROWING WORLD



MAXIMUM THROUGHPUT — CF&I Space Screens with Rectangular Openings have high percentage of open area, provide considerable freedom from blinding and clogging.



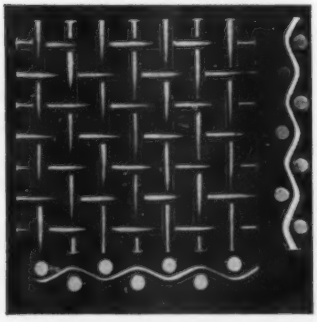
FREEDOM FROM CLOGGING AND BLINDING — The greater open area of CF&I Long Slot Space Screens, plus intense vibration of wires on the long sides of openings, prevents material build up.

You get selectivity with CF&I Space Screens

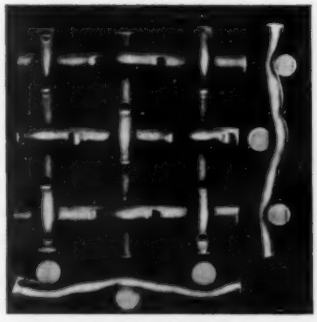
Whether you want high throughput, maximum accuracy or long service life, there's a CF&I Space Screen that will give you the results you're looking for. You can choose from screens with almost any combination of openings, weaves and crimps, edge preparations and effective open areas. CF&I has the experience and facilities — as symbolized by our Corporate Image — to supply screens to meet your most exacting requirements.

All CF&I Screens are available in a complete range of metals including carbon, alloy and stainless steels, aluminum, bronze, Monel and many other alloys. For further information on the screens described here or on any in the CF&I line, contact a local CF&I sales office.

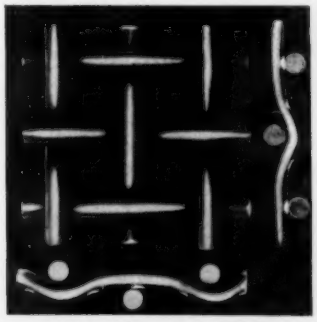
7705



LONG LIFE — Even under severest operating conditions Double Crimp cloth is most effective. That's because it's built so all wires get equal wear.



VERY ACCURATE SIZING — Because each wire of Lock Mesh Cloth is constructed in a "locked-in" position, it's one of the best available for vibrators and trommels.



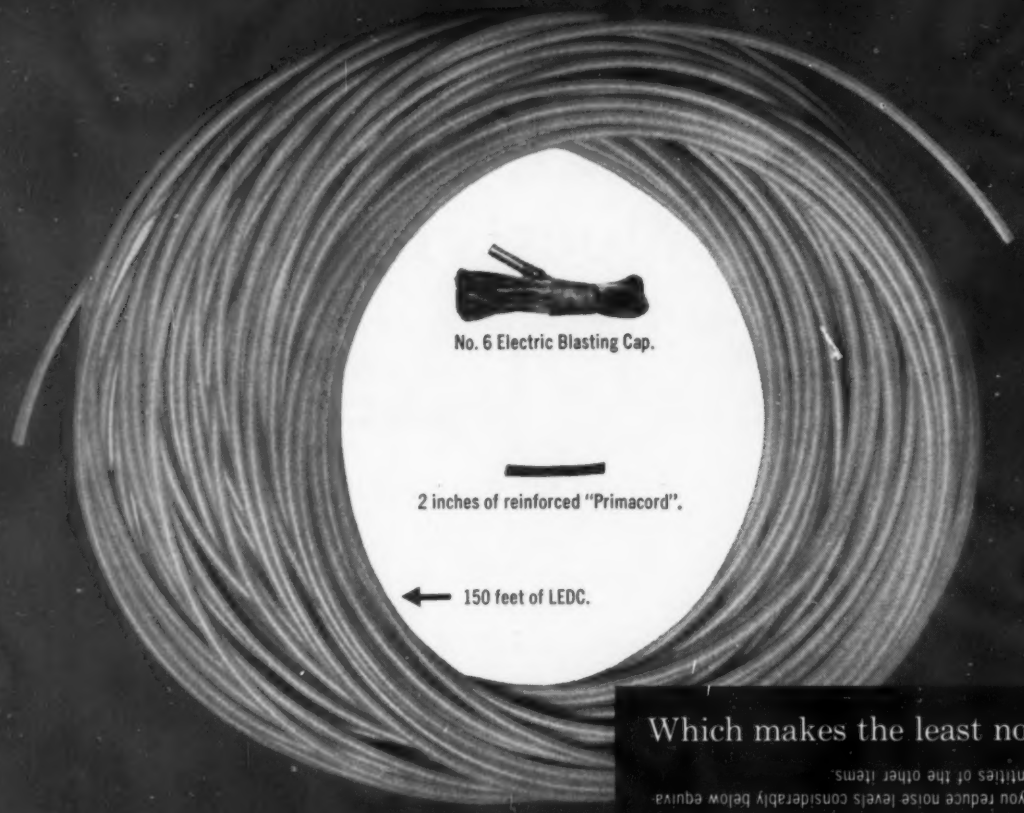
MINIMUM RESISTANCE TO MATERIAL FLOW — With all the crimping on the underside, CF&I Space Screens with Flat Weave set up minimum turbulance to materials going through.

CF&I SPACE SCREENS

THE COLORADO FUEL AND IRON CORPORATION

In the West: **THE COLORADO FUEL AND IRON CORPORATION** — Albuquerque • Amarillo • Billings • Boise • Butte • Denver El Paso • Farmington (N. M.) • Ft Worth • Fresno • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Oklahoma City Phoenix • Portland • Pueblo • Sacramento • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita
In the East: **WICKWIRE SPENCER STEEL DIVISION**—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Phila.
CF&I OFFICE IN CANADA: Montreal **CANADIAN REPRESENTATIVES AT:** Calgary • Edmonton • Vancouver • Winnipeg

CF&I STEEL



Which makes the least noise?

Answer: All three items produce the same amount of noise. Thus when you use the low noise level trunk line blasting system, you reduce noise levels considerably below equivalent quantities of the other items.

Shhhh!

New Du Pont delay blasting system* hushes the noise of quarry, open pit and strip mine blasting

If you have been burying your "Primacord" trunk lines, or have reluctantly switched to electric blasting caps in order to reduce the noise level of your blasting, here's good news.

Reduces noise The new Du Pont Low Noise Level Trunk Line Delay Blasting System* uses LEDC (Low Energy Detonating Cord) developed by the Ensign-Bickford Company in a cooperative program with Du Pont. It muffles the noise without the nuisance and expense of burying the cord. 150 feet of LEDC makes no more noise than one electric blasting cap!—or 2 inches of ordinary "Primacord"!

2 grains per foot This low noise level trunk line system contains only 2 grains of explosives per foot, as contrasted to 50 grains per foot in the regular "Primacord." It is this tiny load that keeps the noise level down. Our customers report noise and vibration complaints from neighboring residents were actually eliminated, when LEDC trunk lines were recently introduced.

Other features This system uses trunk line delay connectors, available in intervals of 10, 15 and 25 milliseconds. You can select the interval best suited to your particular blasting problem. The low noise level trunk line delay blasting system provides an unlimited number of periods at intervals of 10, 15 or 25 milliseconds. And at no time is it ever necessary to place a blasting cap in the borehole.

Available now Your Du Pont distributor or representative can help you reduce your noise problem with new LEDC at once, or answer your questions about it. Call him. Or write Du Pont, Explosives Department, 6440 Nemours Bldg., Wilmington 98, Del.

**Patent applied for*

DU PONT EXPLOSIVES

REG. U. S. PAT. OFF.

Better Things for Better Living . . . *through Chemistry*

RIPPING WITH D9 ELIMINATES SHOOTING SANDSTONE AT THIS MODERN STRIP MINE

Expensive, time-consuming blasting of overburden is a thing of the past at the Harrisonville, Ohio, strip mine of the Swisher Coal Company. Caterpillar D9 Tractors with No. 9 Rippers loosen the sandstone overburden, which is then removed by a fleet of Cat DW21 Tractors, pushloaded by D9s.

In addition to saving the cost of shooting, the Pomeroy, Ohio, company saves the cost of reclamation. DW21s spread the excavated overburden over a large area, eliminate spoil banks entirely. The overburden averages 50 feet, covers a 2-foot coal seam. Production at the mine averages from 1000 to 1200 tons daily.

D9 Tractors with No. 9 Rippers pay big dividends on modern stripping operations. (1) They save time and expense of blasting; (2) reduce wear and tear on loading equipment; (3) eliminate troublesome chunks; and (4) they are versatile—can build roads, clean up and handle other utility jobs.

And now the "King of the Crawlers" is even more rugged, more powerful! The new D9E has a massive new undercarriage that adds hours of life to running gear. A new Caterpillar-developed steel alloy strengthens links, shoes, rollers up to 40%. And the mighty new D9 packs 335 HP in its Turbocharged Engine.

Get the whole story from your Caterpillar Dealer. The new D9E is now available with revolutionary new torque divider power shift transmission. Ask for a demonstration on your stripping operation; you'll see more profit in every pass.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

NEW D9E—
BORN OF RESEARCH
PROVED IN THE FIELD

SKOOPER WINS BLUE RIBBON MINING AWARD

A Mining World Blue Ribbon Equipment Award went to the Koehring Skooper in 1960. Selections were made for the most outstanding equipment contributions to the advancement of minerals industries technology.

...no flying starts

...no spinning tires

...no churning crawlers

SKOOPER SITS TIGHT— KEEPS RIGHT ON LOADING!

No need to run a machine into the ground for big production loading and digging. Skooper delivers big loading tonnages from a standstill, using less horsepower, with less maintenance.

7′ HYDRAULIC CROWD — provides tremendous breakout, heaped loads on every bite without moving the tracks.

360° SWING — no waste drive-in, back-off motion. Skooper swings its 2-yard load around to the truck. Can lift bucket to 12′-10″ height for dumping.

ONLY 64 HP — Skooper horsepower is used for digging, not for jockeying the machine around. Delivers more tonnage with less fuel.

LESS MAINTENANCE — standstill digging and loading means lower maintenance requirements. No tired tires to contend with, either.

Check the Skooper yourself — check its fast cycle time, and unique excavator-crane convertibility. See your Koehring distributor soon.

K62

KOEHRING
DIVISION OF KOEHRING COMPANY
Milwaukee 16, Wisconsin

See your distributor about the 1960 KOEHRING EQUIPMENT SHOW— Waukesha, Wis., week of Sept. 19th.

PROOF
that a Ni-Hard Mill Liner is good to the last ¼ inch

You've heard it said many times..."A Ni-Hard Mill Liner is good to the last ¼-inch!"

Well here's photographic proof; from the Montana mines of The Anaconda Company, where the long life and outstanding performance of Ni-Hard* nickel-chromium-iron alloy liners have saved many thousands of hours of downtime. And done wonders for tonnage too — in both ball mills and rod mills, at the feed end as well as the discharge end.

This "good-to-the-last-¼-inch" performance of Ni-Hard mill liners can do wonders for your tonnage. For if ever there was a service where superior abrasion-resistance coupled with a uniform wear-rate really counts, it's in mill liners. Try a set of Ni-Hard liners in your mills and see for yourself.

Ni-Hard iron's superior abrasion-resistance and uniform wear-rate also count heavily in prolonging the life of feed spouts, pipe elbows, slurry pump liners and impellers, dust-collector cyclones, chute liners and many other parts for ore-processing equipment.

Our detailed, 58-page booklet, "Engineering Properties and Applications of Ni-Hard" suggests many ways to put versatile, long-wearing Ni-Hard to work profitably. Say the word and we'll be glad to send you a copy.

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street INCO New York 5, N. Y.

NI-HARD®

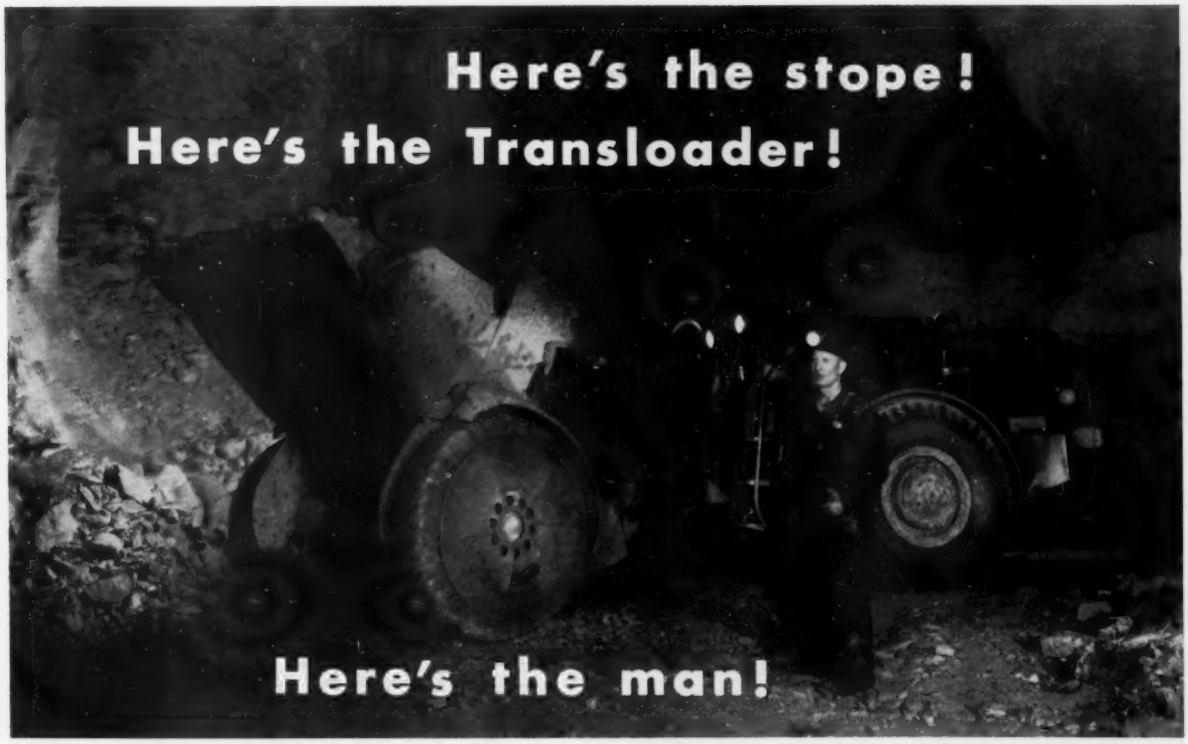
NICKEL MAKES CASTINGS PERFORM BETTER LONGER

It is difficult to believe—but the truth is...

This S-D TRANSLOADER LOADED, HAULED and DUMPED 1,045 TONS in one shift!

THIS WAS NO TEST nor demonstration. This customer and user was backstoping. Several thousand tons had been shot. S-D Transloader operator Robert White was simply loading, hauling, and dumping as usual with his self-loading transport. The one way tram to dump hole was 150 feet. (S-D Transloader also operates more effectively and more efficiently than conventional equipment on long hauls.)

AT THE END OF THE SHIFT MR. WHITE HAD MOVED 1,045 TONS OF HARD ROCK! That was 190 loads! On the following night shift he loaded 180 times for 990 tons. He moved 2,035 tons in two consecutive night shifts!



THE FACTS ARE, FURTHER, that the S-D Transloader requires (1) the *lowest* original cost for tons handled . . . (2) *lowest* maintenance, due principally to extremely simple design . . . (3) *least* ventilation due to low horsepower to work done . . . and (4) *lowest* labor cost per ton!

The performances of many S-D Transloaders in several mines justify *your immediate* investigation! The Transloader is doing a job you cannot afford to overlook! Call us — today . . . 3-4191. Wire or write:
Sanford-Day Iron Works, Inc., Dale Avenue, Knoxville, Tennessee, U.S.A.

WE WILL BE AT LAS VEGAS . . . with the S-D Transloader! At our Sanford-Day BOOTH 43, in addition to the Transloader, you will be able to view documentary movies showing exactly what the Transloader is doing *in action* underground to increase production at tremendous reduction in cost! We invite you to visit with us at BOOTH "43" . . . American Mining Congress, MINING SHOW, Las Vegas, Nevada, Monday-through-Thursday, October 10-13, 1960.

SANFORD-DAY
KNOXVILLE, TENNESSEE

IF YOUR CRAWLERS HAVE "CLASH BOXES" BETTER CHECK THE ADVANTAGES OF THE "EUC" C-6

Without full-power shift even a "brand new" tractor is an obsolete machine in performance and work-ability when compared with the new Euclid C-6 crawler. For the fast response and all-around versatility that's needed in mines, quarries, construction and industrial work, no other tractor has all the advantages you get in the C-6.

Proven Torqmatic Drive provides full-power shift and instant reverse without delay for clutching and shifting . . . with a flick of the wrist you change direction or from one speed range to another. It's the same easy-to-operate power train that has proved its dependable service in thousands of other earthmovers.

Get the facts on how the C-6 can cut costs on your jobs . . . from dozing and ripping to push-loading big scrapers. You'll find the many operating advantages of this modern tractor will bring you a better return on your investment.

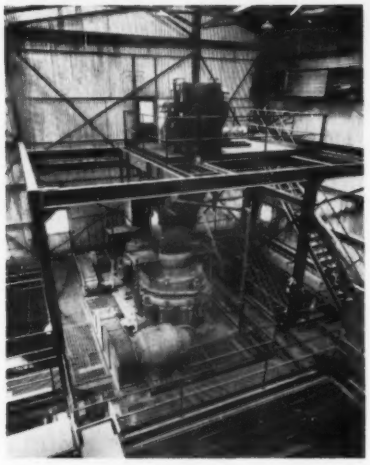
EUCLID DIVISION OF GENERAL MOTORS, CORP., CLEVELAND 17, OHIO

DOZING and RIPPING **. . . plenty of power, easy operation and good stability make the C-6 tops for work in rough going and heavy material.**

GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE



Jones & Laughlin Ships from New Lind-Greenway Mesabi Iron Mine

A new iron mine which will produce about 10 percent of Jones & Laughlin Steel Corporation's blast furnace requirements has been put into operation. Known as the Lind-Greenway, it is expected to produce some 700,000 gross tons of high grade beneficiated ore per year for many years.

Located on the extreme west end of the Mesabi Range near Grand Rapids, Minnesota, the mine consists of two separate open pits, one on each side of the Prairie River. A truck haulage bridge connects the pits. Crude ore is mined by conventional power shovel methods as shown in adjacent picture. Ore is hauled to a concentrator and washed before shipment. The Symon's cone crushers at the beneficiating plant, pictured here, crush 100 tons of ore per hour to minus–1¼-inch.

The wash plant can handle nearly 500 tons of ore concentrate per hour. After beneficiation it is moved by conveyor belts to railroad cars for shipment to the company's iron-making furnaces in Pennsylvania and Ohio.

The mine is operated as part of Jones & Laughlin's Minnesota Ore Division, which also operates mines near Calumet, Hibbing, Gilbert, and Virginia, Minnesota. Output from the new operation is expected to replace that from the Columbia mine at Virginia which will probably be worked out by the end of this year.

About 80 men are employed at the Lind-Greenway mine, but this figure is expected to rise to 200 when full production is reached. Most of these employees will be transferred from the company's other mining properties in Minnesota, according to Harry F. Kullberg, manager of the Minnesota Ore Division headquarters at Virginia.

A lease on the Lind portion of the property was obtained by Jones & Laughlin in 1913. The Greenway portion, acquired in 1948, was operated by another company during World War II.

Jones & Laughlin plans to add facilities for heavy media treatment at Lind-Greenway in the future as leaner ores are encountered.

Bethlehem Copper Options Barvue Mill

The Highland Valley copper project of Bethlehem Copper Corporation in British Columbia may reach the production stage early in 1962 if two current development plans work out.

The Sumitomo group of Japan, which has already invested $350,000 in the Bethlehem project, has taken an option to provide further funds to place the property in production. The agreement provides that the option be exercised by February 28, 1961. Cost of putting the project into operation at the rate of about 4,000 tons per day would be between $7,500,000 and $9,000,000.

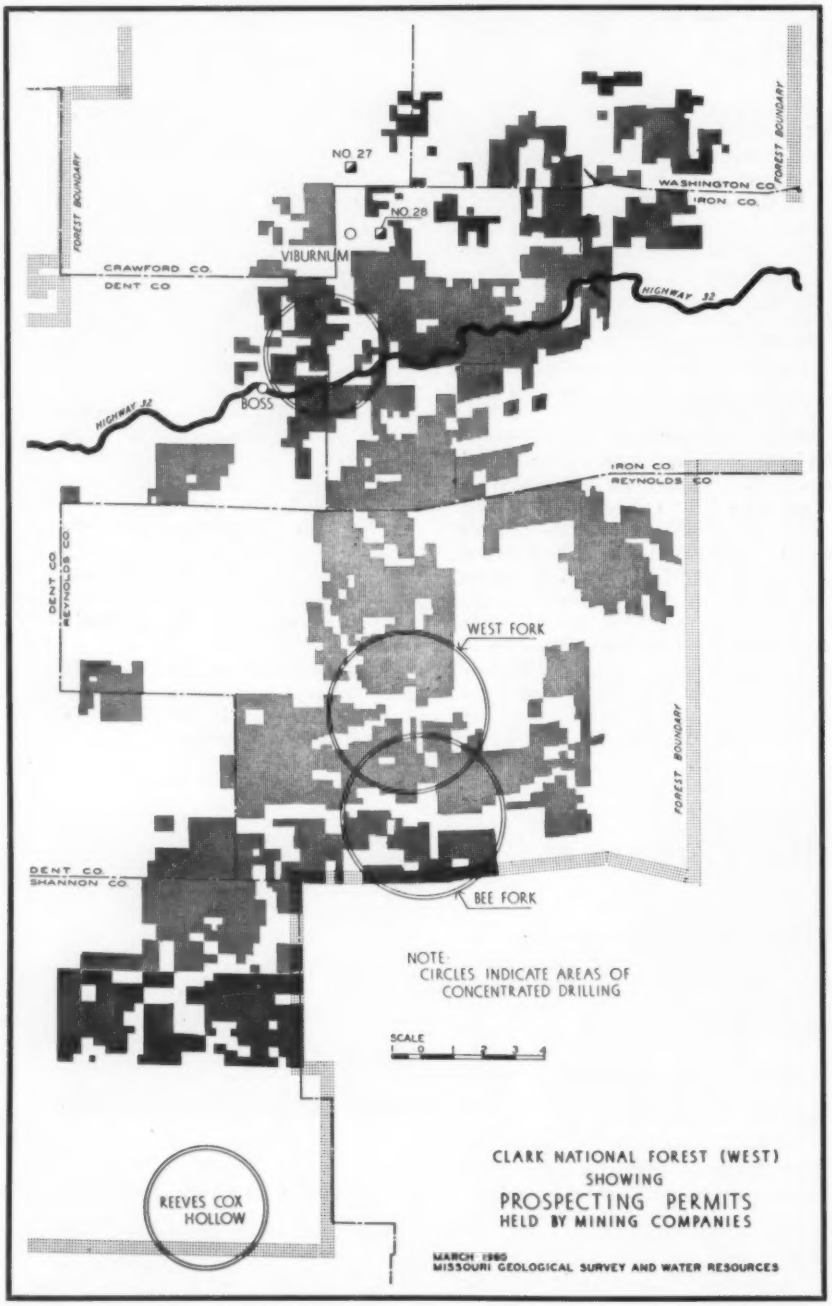
The Japanese have also taken an option on the 5,000-ton capacity Barvue zinc concentrator and plant now owned by Manitou-Barvue Mines. The idle mill pictured here would be moved from the Barraute district in northern Quebec to Highland Valley. Purchase price is estimated at $1,500,000.

Exploration of the big porphyry-type copper deposits continues and preliminary results have been most encouraging in a new "A" anomaly zone. This area is expected to prove of higher grade than either the Jersey or East Jersey zones which contain the ore bodies on which production figures have been based.

Plans call for open-pit mining at the project where more than $2,500,000 has already been spent in exploration.

Major Missouri Ore Discoveries

made in buried Bonneterre formation by drilling holes from surface started a leasing and exploration boom; several recent discoveries may make new mines

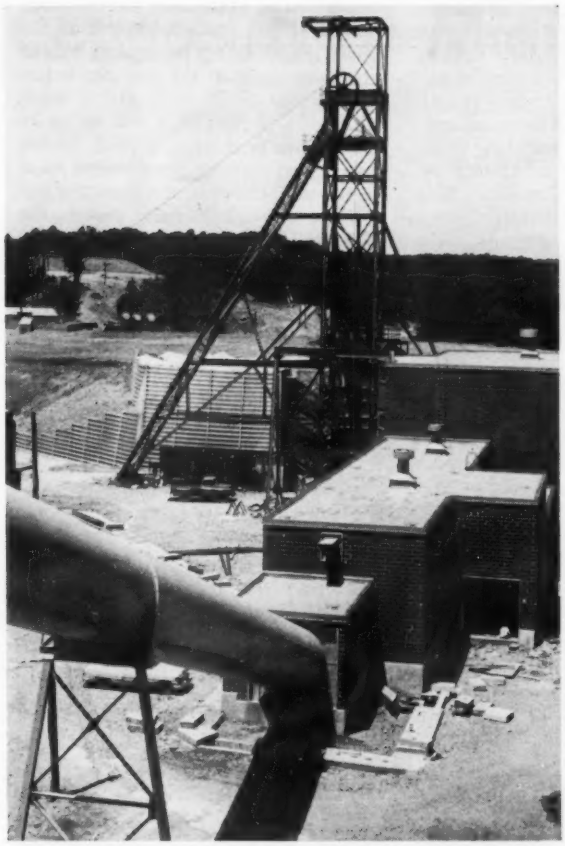


by William C. Hayes
Mr. Hayes is Assistant State Geologist for the State of Missouri

Recent iron and lead discoveries in Missouri have resulted in the most extensive and intensive mineral exploration (dollarwise and in geographic extent) that has ever been experienced in the state. As of this writing, at least twelve major mining companies are actively engaged in mineral exploration in Missouri.

Some companies have made major discoveries, others are drilling, and still others have geologists in the field.

The list of these companies reads like the "Who's Who" of the mining world to include: St. Joseph Lead Company; National Lead Company; Meramec Mining Company; American Zinc, Lead and Smelting Company; American Smelting and Refining Company; Bear Creek Mining Company (Kennecott); New Jersey Zinc Company; American Metal Climax, Inc.; Pacific Uranium Mines, Inc.; United States Smelting, Refining and Mining Company; and Eagle-Picher Company.



NUMBER 28 SHAFT of the St. Joseph Lead Company at Viburnum, Missouri. Large diameter pipe in foreground is the ore conveyor from the primary crusher to ore bins.

STEEL HEADFRAME of the Number 27 Shaft of the St. Joseph Lead Company at Viburnum, Missouri. Ore stockpile is just visible to right behind loading bins.

Aeromagnetic Surveying Provided Detail Data

A vertical intensity magnetic map of the State of Missouri, published by the Missouri Geological Survey and Water Resources in 1943, indicates several notable magnetic anomalies. One of these, near the town of Bourbon, Crawford County, was drilled by the U. S. Bureau of Mines in 1943 and 1944. Approximately 125 feet of iron mineralization averaging 43.5 percent iron was encountered in Precambrian felsites 1,600 feet below the surface.

Approximately 3,500 square miles of aeromagnetic surveying has provided detail data on known anomalies and has disclosed others. A 3,000-gamma anomaly, eight miles south of Sullivan at Pea Ridge, Crawford County, was drilled by the St. Joseph Lead Company in 1953. Later drilling proved iron mineralization of ore grade in Precambrian felsite between 1,400 and 3,000 feet in depth. The Meramec Mining Company was formed as a joint venture of St. Joseph Lead Company and Bethlehem Steel Corporation to construct facilities for exploitation of the ore.

At least three of the other magnetic anomalies that have been drilled indicate ore possibilities. One of these also contains ore grade copper.

Lead production from the Indian Creek Mine of St. Joseph Lead Company (some 25 miles northwest of the Lead Belt) in 1954 was the initial step in extending the known commercial lead deposits in southeast Missouri outside the traditional Lead Belt. In 1953 the same company began exploratory drilling near the village of Viburnum in extreme northwestern Iron County, and their discovery of major lead deposits in this area may result in a lead district comparable to the Lead Belt 35 miles to the northeast.

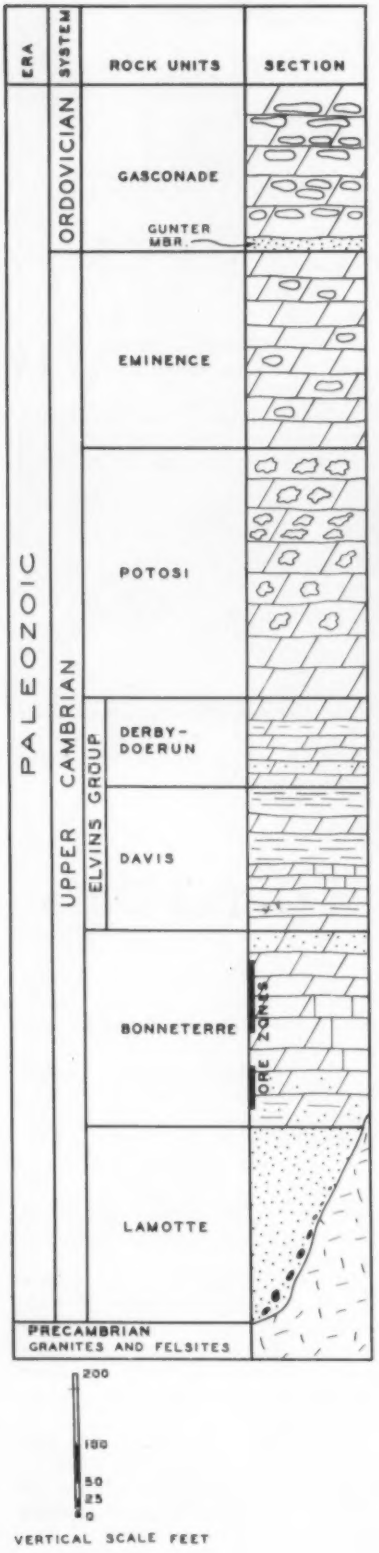
In the Viburnum district galena in the Bonneterre formation occurs in proximity to buried Precambrian knobs and ridges. Surface exposures include formations from the Gasconade to the Davis which immediately overlies the Bonneterre. Depth of exploratory drilling for lead is limited by the top of the Precambrian granites and felsites which may be buried by as much as 1,200 feet of cherty dolomite and some limestone, sandstone, and shale. Test holes are usually churn drilled through the very cherty Potosi with the hole being completed by diamond drilling.

In many places the Potosi formation is an important aquifer which yields as great as 400 gallons per minute. Considerable difficulty has been experienced with the resulting water problem, but apparently this problem is being solved.

A large part of the land in this area is within Clark National Forest and is interspersed with land held in fee by private ownership. The accompanying map indicates the area of Federal For-

Generalized Upper-Cambrian Section

Reynolds County, Missouri

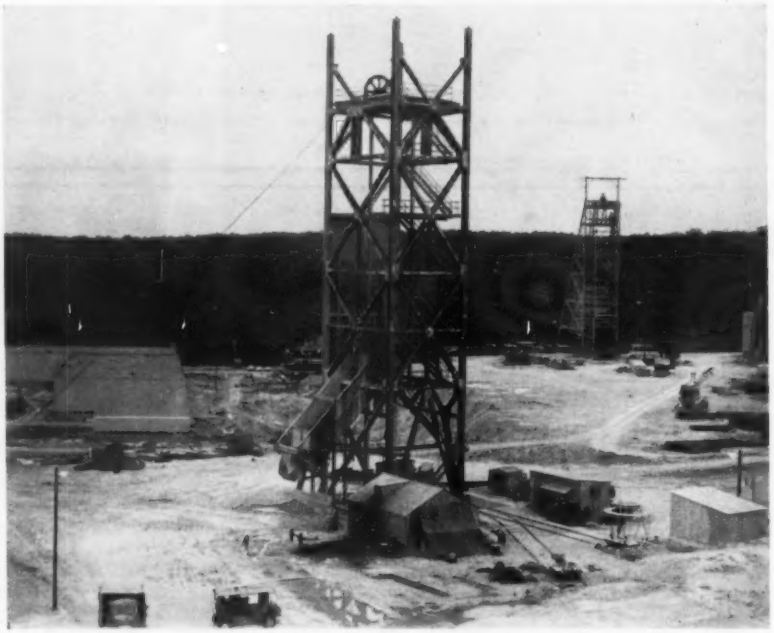


est Land under prospecting option and (or) mineral lease as of March 1960. Areas of intense exploratory drilling are indicated only in a general manner on the map.

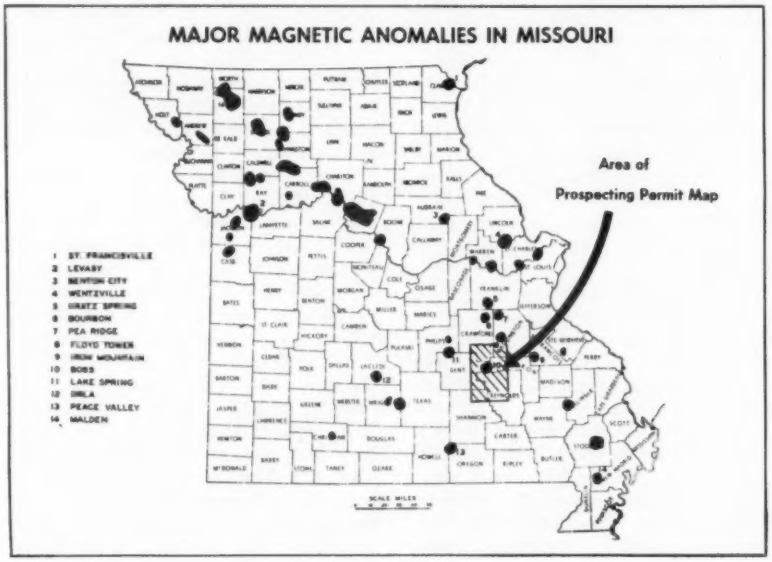
A new town site of Viburnum consisting of some 520 acres along State Highway 49 is being developed by the St. Joseph Lead Company. The plan provides for 400 residential sites, shopping center, school grounds, park, and utilities.

At least three shafts are contemplated by the St. Joseph Lead Company: No. 27 (Kilmer shaft, 3 miles northwest of Viburnum) has been bottomed at 804 feet, and ore from this shaft is now being stockpiled; No. 28 (Conway shaft, at the mill site immediately east of the town site) is being shafted; and No. 29 is still to be located. Ore from Nos. 27 and 29 will be trucked over company-owned roads to the mill. Concentrates from the mill will be trucked 30 miles east to the Missouri Pacific Railroad.

Present plans call for the first 3,000-ton section of the mill to be operative in 1960. A second equal capacity unit is to be ready in 1962. END



PLANT AND SHAFT SITE of the Pea Ridge, Missouri, iron deposit of the Meramec Mining Company. The Number 1 shaft for men and materials is in the background. The Number 2 shaft for ore is in the foreground with machine shops at left.



Congo's New Minister of Mines

has long background in Mines Service Department and was the Congo representative at recent International Tin Council

MINING WORLD's Special Correspondent was among the few hundred people who witnessed the Proclamation of Independence, on June 30 1960, in the Palais de la Nation, Leopoldville. He writes:

"A felicitous speech by the Belgian King and a dignified statement by Mr. Kasa-Vubu, Minister of State, were followed by an appeal for support from Mr. Patrice Lumumba, Prime Minister. The formal signing of the deeds brought this historic occasion to a close. It was like the launching upon uncharted seas of a new ship, still without compass or rudder, but making lots of steam. On deck and in the upper holds lie mineral cargoes of incalculable worth.

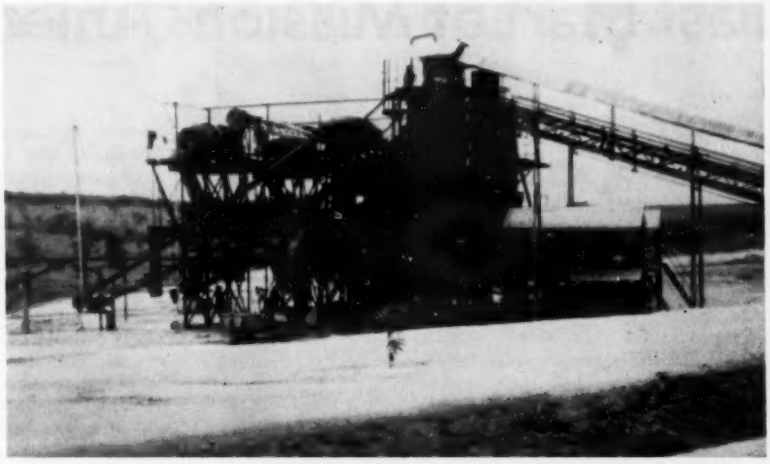
"Leopoldville: an ultra-modern city well worthy of its status as the financial, commercial, and manufacturing center of a vast country, can claim few mining links. Such activities are a thousand miles away. A mining company office would be hard to find. It is where the profits of mining, through taxation and national shareholdings, will be spent. There probably will be less consideration for the miner, on the job, than is shown today by mining companies in Katanga, Kivu, or Kasai. Credit to date is due to the government Mines Service under Director A. Vaes, and the Geological Service, today under Mr. A. Gosseye, with headquarters in Leopoldville. Under the new organization, whatever the trend toward provincial viability, these agencies should gain in influence.

"I have talked with Mr. M. Ruhadingwa, the new Minister of Mines, who is in control of these departments, as well as laboratories and research. The Minister is rightly averse to giving any formal interview today. He is quite a realist, not addicted to platitudes or other political evasions, and is solely trying to square up to his new responsibilities. A man under 40, Mr. Ruhadingwa has had a good general education, without reaching University standards—probably unattainable in his day. He was selected for the high appointment on his record in the Mines Service branch office in Bakavu, in Kivu Province, which is the chief producer in the Congo of tin, tungsten, colombite, and beryl. He was employed as a clerk from 1948, became office secretary about three years ago, gaining a reputation for thoroughness and keen interest in his duties. With an eye to the future, he was this year sent as a delegate to New York, New York to attend the conference of the International Tin Council. He enjoys the genuine good-will of his erstwhile seniors.

"The Mines Department employs about 20 engineers at headquarters and five branches, on inspections, research, and records. The Geological Service, less likely to be provincialized, is understaffed for a country of this area and unfavorable topography, having only a dozen professional geologists at work.

"A generation must pass before these Departments could be nationalized at a professional level. Mining and geology, for the same reasons, are not popular with the educated African. Tough stuff like that is for the pioneer stock, the sort of people who made the Congo what it is. The politician is going to dominate the scene, creating or banishing confidence in the future of this great mineral region. May uninterrupted production prevail." END

LARGEST CONGO copper and cobalt mine of Union Miniere du Haut Katanga was closed when electric power plant operators fled to Northern Rhodesia. This is Musonoi pit at Kolwezi in the rich Katanga Province which wants local government.



WORLD'S LARGEST DIAMOND production comes from the Congo. This is a typical field washing and concentrating plant near Bakwanga. In 1959 the Congo produced 60.8 percent of the total diamonds mined in Free World.

STRIPPING ALLUVIUM goes smoothly as 55-ton Euclid truck is loaded by Bucyrus-Erie 190B shovel aided by Le Tourneau-Westinghouse dozer. Most of the alluvium is blasted which increases tonnage per shovel and minimizes dipper teeth wear.

Fast Start at Mission: American Smelting

The most important new copper mine in the United States is rapidly being developed 20 miles south of Tucson, Arizona. The Mission Project of the American Smelting and Refining Company is now employing over 500 men to develop the open-pit mine, build the mill, and construct the extensive service area that will be required for this $43,500,000 operation.

Mill construction and the stripping of alluvium covering the ore body were scheduled to be completed by the spring of 1962. This target date probably will be improved. However, much work has yet to be done before the first copper concentrates leave Mission for one of ASARCO's southwestern smelters.

Exploration work by the American Smelting and Refining Company was begun in the Pima Mining District in 1954. This is an area just 16 airline miles south-southwest of Tucson and only three-quarters of a mile northeast of the openpit mine of the Pima Mining Company. Alluvium everywhere overlies all bedrock formations. However, earlier geophysical exploration had detected a high anomaly in the area. A diamond drilling program was initiated by ASARCO in 1954. After the drilling program showed the presence of disseminated copper values a 375 foot exploration shaft was sunk in 1958. By early 1959, the Mission ore zone was well delineated and the major geologic features interpreted from drill cores and several hundred feet of lateral workings from the shaft, as well as several raises.

Under 200 feet of alluvium, the ore body occurs in a complex of sedimentary rocks that have been metamorphosed to quartzite, hornfels, tactites, and marbles. The mineralized zone overlies barren sedimentary argillite and basement granite. Igneous felsite porphyry and andesite dikes, as well as irregular monzonite stocks cut the several metamorphic formations. All rocks above the lowest marble are pervasively altered by hydrothermal processes and contain disseminated copper sulphide mineralization. On the average, the originally calcareous rocks, tactite and hornfels, carry the most copper values; argillite has less; quartzite and monzonite have the least. Leaching and enrichment of copper are confined to a thin layer at the top of bedrock, and the amount of enriched copper ore is quite small. The mineralization process is considered to be hydrothermal-metasomatic and the deposit contains many of the principal geological elements of the so-called porphyry-type ore bodies.

When management received the green light to go ahead with the development of the Mission prospect, ASARCO engineers estimated that they would have to strip in excess of 45,000,000 tons to expose the ore body and start the benches. Stripping of the 200 feet of overburden was started in August 1959. By May 1, 1960, over 8,000,000 tons had been removed, and two 50-foot benches in the overburden opened up. This stripping as currently scheduled is progressing at the rate of 2,500,000 tons a month. Stripping is being done with two 1800 P & H shovels and two 190B Bucyrus-Erie shovels all equipped with nine-cubic yard dippers. Haulage is handled by 21 Euclid R55 trucks equipped with G.M.C. and Cummins Diesel engines. These 55-ton trucks haul the alluvium to two waste dumps—one of which is on the San Xavier Indian Reservation.

The alluvium overburden, consisting of partially cemented gravels and wash, breaks easily. However, tests showed that blasting increased daily tonnage per shovel 25 to 50 percent. Also, the light blasting minimized dipper teeth wear. Accordingly, of the stripping now being removed, most of it has been blasted ahead of the shovels.

Target date for production: spring of 1962

Construction started on concentrator

SECOND 50-FOOT BENCH is opened up by a P & H 1800 shovel with a 9-cubic yard dipper.

WASTE DUMP in background receives part of the 2,500,000 tons a month that is being stripped from Mission ore body.

Now Stripping 2,500,000 Tons a Month

Until recently, blast hole drilling was done with a nine-inch Bucyrus-Erie drill borrowed from the ASARCO Silver Bell operations. Now, two Reich 850 crawler-type rotary drills handle the job drilling the 12-inch blast holes.

Benches in the overburden are first prepared with bulldozers, scrapers and rippers. Shovels are put in when the bench heights become greater than 20 feet. Originally, there will be four 50-foot benches in the alluvium material, while plans for the ore body call for 40-foot benches. Truck haulage ramps are planned on seven-percent grades.

All pit haulage will be handled by trucks because of their greater flexibility.

After extensive tests made for the bearing qualities of the alluvium, construction on the mill began March 1, 1960. This 15,000 ton-per-day flotation concentrator, conveyor facilities and adjoining crushing plant were designed, and are now being erected, by Western-Knapp Engineering Company of San Francisco.

Other construction work at the Mission Project is being handled by ASARCO and several sub-contractors from Tucson and elsewhere. ASARCO has done all the rough grading for the mill site, constructed water storage facilities, and is doing the pit design and all stripping.

Most of the service area has already been built. A well-stocked warehouse has all the necessities for construction, and a large machine shop is to be equipped with all the tools for the quick repair and maintenance of equipment. A complete tire repair shop and a fuel-lubrication station maintain the rolling stock. A spacious air-conditioned office building is in good use against the plus 100-degree temperatures that are common to this part of southern Arizona.

Electric power for the project is purchased from the Tucson Gas, Electric Light and Power Company of Arizona.

CONCENTRATOR FOUNDATIONS are poured to support the 15,000 ton-per-day mill east of the proposed open pit.

To bring in equipment and supplies, and to haul concentrates out, the Southern Pacific Company has built a six-mile railway line into the Mission property. This standard gauge line is a spur off their main Tucson-Nogales route.

The Mission Project of the American Smelting and Refining Company is going ahead on schedule. The ASARCO staff in direct charge of the project is headed by T. A. Snedden, Manager of the Southwestern Mining Department and R. B. Meen, Superintendent of the Mission Unit. Engineering design is directed by E. H. Scheick, Assistant Director of Central Engineering. END

By George O. Argall, Jr.

Editor

JUNGLE PROSPECTORS Jesus Cabarrus, Daniel Bronk, and Jose Carpi with native guides. Mr. Carpi was one of the discoverers of manganese which led to copper.

New Copper Discovery May Make Big

Another big copper mine and a new manganese mine are more than a possibility in the Philippine Islands. These will be new mines in a new district in east central Luzon and should open an entirely new copper province in these highly mineralized Islands. See above for location.

Limited surface prospecting at Dimakawal, in the rain forest jungle covering the steep mountain slopes, together with assay results of the first 18 short diamond drill holes all point to important discoveries of both copper and manganese. The first geological correlation has just been made from drill hole data. Results are beginning to fit into a pattern and every hole adds much more information. The most important holes are being drilled now. If these deep vertical holes find ore grade continuation in depth, and there are strong geological indications that they will, a major copper mine can be developed.

The most aggressive mining man in the Philippines today, dynamic Don Jesus S. Cabarrus, is directing exploration at this new discovery. He is president and general manager of Acoje Mining Company, Inc. and Marinduque Iron Mine Agents, Inc. These companies are major producers of copper, molybdenite, metallurgical chromite, iron, zinc, and pyrite. Marinduque's Sipalay copper mine and mill are mining and milling 4,000 tons per day of copper-molybdenite ore. The firm's Bagacay mine on Samar has shipped 137,308 tons of 14.97 percent copper ore in the last four years. This was all mined from one shallow open pit from which only 337,372 cubic meters of waste was stripped.

This success at Bagacay is an example of the type of mine that can be developed in the Philippine jungles. It was only five years ago that a prospector brought a piece of carbonaceous rock to Mr. Cabarrus and said that he had found a coal mine. The sample was sent to the laboratory to determine the ash and BTU content. There, the chemical engineer was surprised at the very high insoluble percentage and quickly found it to be copper—35 percent copper. Roads were built, a mine was developed, and a Diesel electric power plant built. More recently a 500-ton-per-day flotation mill has been completed to treat the lower grade copper-zinc ore underlying the blanket of high grade calcocite.

Today the new Dimakawal prospect looks far more encouraging for a large tonnage long life operation than Bagacay. There is no question but that the new discovery is getting the same aggressive find-out-fast management that made Bagacay such a remarkable mine. Mr. Cabarrus has made the new discovery part of Acoje Chromite, where it has the most important advantage of skilled management under L. W. Shaner, vice president in charge of operations.

How discovery was made

Prospecting is tough in the Philippines due to dense vegetation and the altered soil mantle. That's why prospectors first walk the stream beds and that's how high grade manganese float was found. It proved a difficult job to trace this float to its source on a high ridge. Word of the discovery was brought to Mr. Cabarrus who led a geological party into the area. It took two days to cut a path through the jungle and to climb from the sea coast to the manganese outcrops. It was soon apparent that a large deposit of manganese was present. The picture above shows only part of the massive outcrop of hard high grade 46 percent manganese. Immediately claim staking was started. To date 108 claims have been staked. The party returned to Manila and a well organized prospecting crew was dispatched to the area. It won the friendship of the local native tribe and hired them as guides and porters. These natives are a distinct tribe for the Philippines and pursue head hunting as a normal way of life. They are very short and have long kinky hair common to Negritos rather than the straight hair so characteristic in the Islands.

When this prospecting party reached the mineralized area they found that a major landslide had occured. Believe it or not this slide, below the manganese outcrop, has disclosed massive sulphide boulders containing much chalcopyrite. It was only a short time until sulphide mineralization was found in place.

Acoje's geologist, Anthony Cerkel, was sent to the property and recommended diamond drilling. Drill stations were cut on the steep hillside. The natives, becoming friendlier every day, were hired to cut a trail through the jungle, and carry supplies, a diamond drill, and gasoline from the coast. A surface maping program was started.

Supply has proved a major problem. The sea coast is steep and rocky with a continual heavy onshore surf. Small canoes were used to land supplies during the early

DRILL CORES are logged, split, and assayed at Acoje Chromite's Zambales geological office. Tony Cerkel holds tray.

Philippine Mine

exploration. With early diamond drilling favorable, survey crews were sent into the area to find and survey a road to the sea coast and south to the very small port of Casiguran at the head of the sheltered Casiguran Sound. The site for a 3,000-foot-long level air strip was found along the coast at Dinapiqui Point near the prospect. The first attempt to land bulldozers and other equipment to clear the heavy jungle and build the air strip failed, as the LCT was swamped in the heavy surf. The second attempt was successful and construction is under way now. As soon as the strip is finished, supplies can be flown in by DC-3.

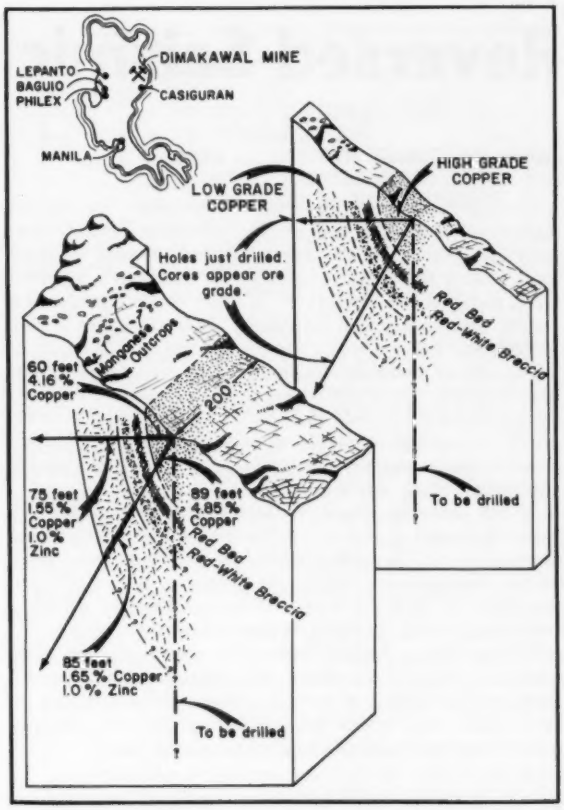
Drill results to date

Mapping and surface geology is most difficult. Structurally the area appears to be silicified dome or stock with the three known manganese deposits forming a halo above the copper. The rock is altered basic volcanics and sediments with manganese concentrated in a manganese-rich formation.

First diamond drill holes show what is apparently two distinct copper ore bodies--the high grade near the surface, and a larger steeply dipping underlying zone which is lower grade. Drilling was started on the high grade outcrop. The first hole cut 60 feet of 4.16 percent copper before mineralization faded out. The hole was continued to prospect below the manganese outcrop and resulted in the discovery of a 75-foot width of 1.55 percent copper and 1.0 percent zinc. This is the lower grade deposit which is not known to crop out at this time. Along strike, 200 feet away, a second fan of short holes has been drilled. Cores appear to be of equal or higher grade than those from the first fan. Assay results are awaited.

The diamond drill used for these holes had a maximum capacity of 250 feet. A larger drill which can reach a depth of 1,000 feet has just been placed in operation to drill vertical holes to determine if there is a down dip continuation of the low grade zone. Should width and grade continue, a very imprtant ore body could be outlined. With the limits of mineralization undetermined in depth and along the strike at both ends, there is the immediate possibility of developing several tens of millions of tons of copper ore.

Dimakakal is the brightest prospect in the Philippines today. END



DIMAKAWAL PROSPECT in relation to major Luzon copper mines. Known geological and assay data are shown in sketch.

HARD MASSIVE high grade manganese outcrop was found high on ridge by tracing float. Note four men in picture.

Reversed Seismic Profiles provide better

James W. Crosby III

Seismic testing to determine rippability factors for buried rock is a handy tool which Caterpillar Tractor Company has placed in the hands of earthmoving contractors. Unless the method is properly employed, however an inexperienced observer might obtain misleading results concerning the rippability characteristics of the underlying rock.

The dip of bedrock and slope of the surface introduce factors which may distort the conclusions reached if a seismic profile is taken only in one direction. Though a reversal of the seismic study is more time consuming it will provide more meaningful answers concerning the possible application of rippers for moving the rock.

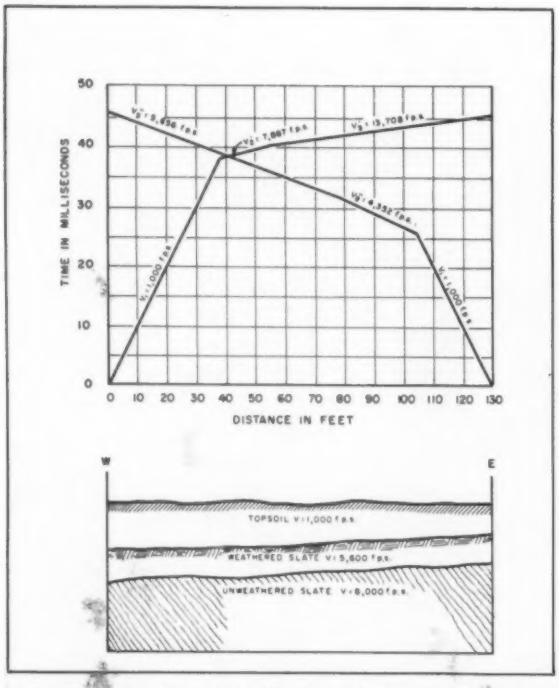
In any refraction study, a distinction must be made between true and apparent velocities of longitudinal waves in a soil or rock formation. In the case of continuous, horizontal, homogeneous strata, the velocities indicated by a time-distance plot are true velocities. Published information on rippability factors has thus far considered only this condition, with a slight allowance for dip by the so-called marginal zone. The writer's experience has shown that horizontal attitudes of rock layers are the exceptions in most areas with which he is familiar. Bedrock surfaces underlying soil mantles usually show some dip.

Mr. Crosby is mining geologist, Division of Industrial Research, Washington State University, Pullman, Washington.

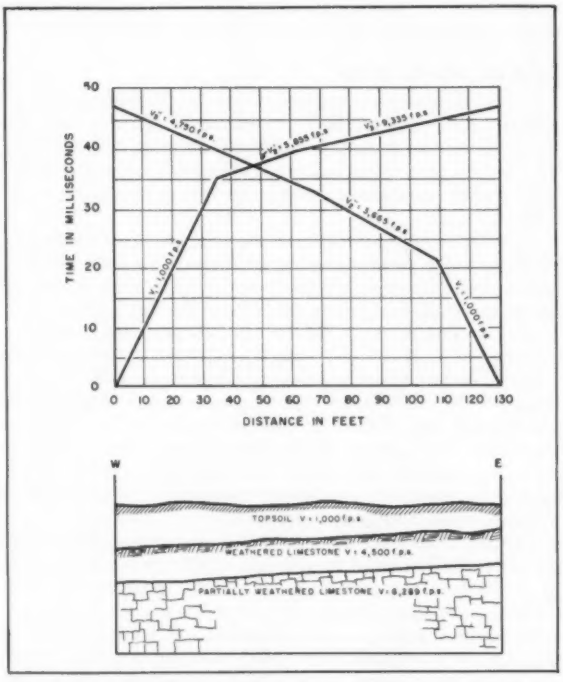
Dipping surfaces or strata require the introduction of the concept of apparent velocity to refraction seismology. In shooting a profile across dipping strata, or a dipping bedrock surface, the velocity in the materials below the soil zone, as indicated by the time-distance plot, will be an apparent velocity. To obtain the true velocity of these materials, it is necessary to shoot the profiles from both ends of the geophone spread. In the case where a single geophone is employed, signals must be generated by a hammer blow and received, successively, by the geophone placed at opposite ends of the refraction profile. True velocities are calculated from the appparent velocities of the reversed time-distance plot.

It will frequently be found in shooting reversed profiles that the first segments of the time-distance graph, corresponding to the velocities in the soil zone, are not the same. As refraction theory requires that they be equal to make possible a solution for the deeper layers, an average value must be established from the field-determined velocities. This may be a straight numerical average or some more highly refined value, best established by consideration of the particular area being studied.

To illustrate the effect of dip and how it may alter the interpretation of rippability data, several cases will be discussed. In the first 3 examples, dip of the bedrock surface is assumed to be three degrees. In the last example the dip of the bedrock is three degrees, but is opposed by a surface slope of two degrees. Apparent velocities are shown on the time-distance plots, while true velocities are indicated on the cross sections. In all examples it is to be noted



1 TIME-DISTANCE PLOT of up-dip shooting yields velocities classifiable by chart at upper right as non-rippable rock. Apparent down-dip profile indicates the opposite condition. True velocities, however, (shown on geologic section) show that weathered slate is rippable and unweathered slate in non-rippable. Bedrock dip of 3° causes viariations.



2 IN LIMESTONE: Up-dip shots indicate that weathered and partially weathered rock are non-rippable. Down-dip shooting classified weathered rock as rippable and the partially weathered rock as being in marginal zone. True velocities (on section) place weathered rock in marginal zone and partially weathered rock in non-rippable class.

rippability factors

that discrepancies between true and apparent velocities are appreciable. With greater dip angles, still greater divergence would be noted. In general, the larger the velocity spread between the top soil and the weathered bedrock, the greater will be the velocity variation caused by dip.

Figure 1 is a cross section of slate bedrock overlain by topsoil. The corresponding time-distance plot is shown above it. The true velocity in the weathered slate is 5600 feet per second which, according to Caterpillar data, would indicate rippability. The velocity in the unweathered slate is 8000 feet per second, and it would not be capable of being ripped. If shot in only one direction, it can readily be seen that much misleading information would be obtained. Shooting only to the east, an apparent velocity would be obtained for the second layer of 7887 feet per second. The third layer would show an apparent velocity of 13,708 feet per second. These values would indicate a complete lack of rippable characteristics. Shooting west, apparent velocities of 4352 feet per second and 5656 feet per second are obtained for the second and third layers, which would indicate rippability of both weathered and unweathered materials. Calculations of depth from either of the profiles would be grossly in error. Only a unique solution of the reversed profile will give the true velocities and depths which are needed.

Figure 2 is a profile shot over weathered limestone and its corresponding time-distance plots. The true seismic velocity of 4500 feet per second in the weathered limestone places it in the zone of marginal rippability. The true velocity of 6289 feet per second in the partially weathered

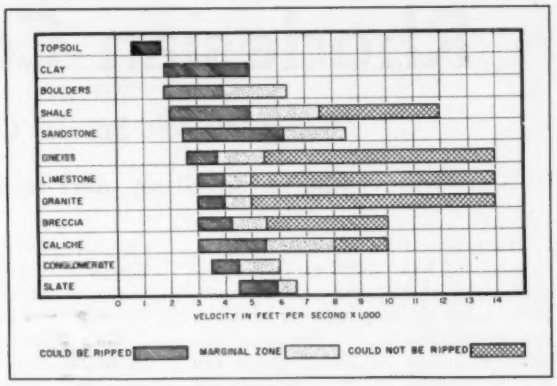
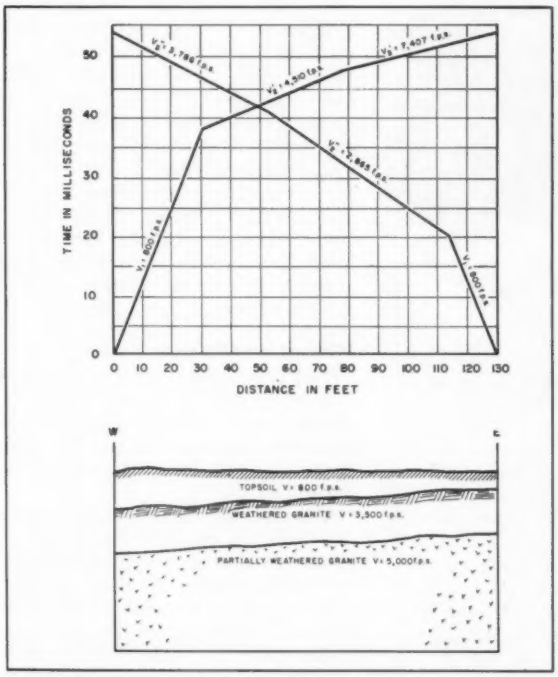


CHART relates ripper performance to seismic wave velocity.

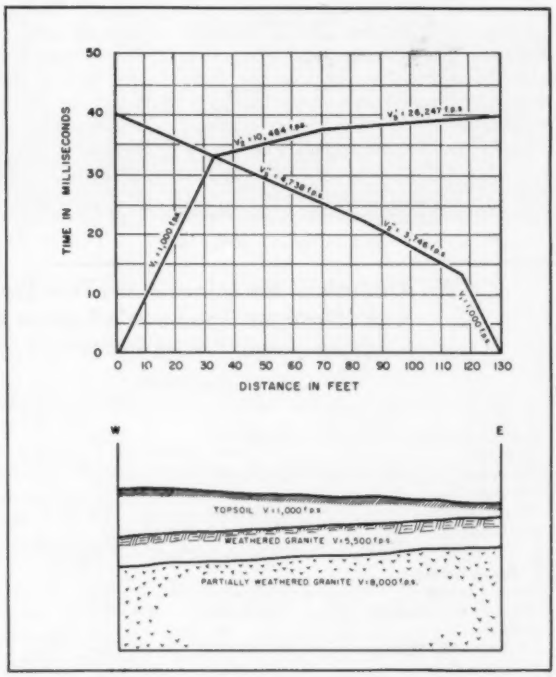
limestone indicates this rock could not be ripped. Shooting east, the second and third layer apparent velocities of 5855 feet per second and 9335 feet per second both infer non-rippability. Shooting west, the apparent velocity of 3665 feet per second in the second layer categorizes the material as being rippable, while the apparent velocity of 4750 feet per second in the third layer places it in the marginal classification.

Figures 3 and 4 are both profiles shot over granite bedrock. A study of the cross sections and refraction profiles produced from them, again reveals the large discrepancies that may be expected between true velocities and apparent velocities.

The seismic testing method developed by Caterpillar is a very valuable technique, particularly in virgin areas where there has been no test drilling. Reversed studies will require more complicated calculations, but are well worth the effort. END



3 IN GRANITE: True velocities on section show that the weathered zone is rippable while partially weathered rock is in marginal category. Up-dip profile places the weathered granite in marginal zone and unweathered rock in the non-rippable zone. Down-dip shooting indicates another set of conditions caused by dip of bedrock.



4 OPPOSITE DIP of bedrock and surface. True velocities and up-dip shooting suggest that the granite could not be ripped. Down-dip plot of time-distance relationships indicates that the weathered granite would be rippable and the partially weathered granite would be in marginal zone. All four examples show how dips can affect profile readings.

Rhodesian Copperbelt Mining

Mining World's Special Correspondent outlines geology and mining—milling, smelting, and refining will be described in an early issue

The copper field of Central Africa, as a whole, has produced 15,000,000 short tons of copper. Ore reserves, proved by development or drilling, contain another 40,000,000 tons. Ultimate resources of lower grade ore defy prediction, for economic, no less than geological reasons.

Combined production for the Congo and Rhodesia, today exceeds 830,000 short tons a year, of which nearly two-thirds come from the Copperbelt.

The international boundary

The field comprises a great arc of crumpled sediments 300 miles long by 80 wide, stretching from the Angola-Congo border to the Roan Antelope Scattered throughout are 40 mines—active, idle or exhausted.

The geologist, with his bold continental conceptions, shows scant respect for national boundaries, but he should not sweep his hand casually over the Central African map. The meandering line which divides the Congo and Rhodesia cuts strangely deep. To the north of it, the Katanga ore deposits lie at the Upper Roan horizon, incredibly disturbed, commonly rich to sub-surface and allowing open-cast methods to be universally applied. They are irregularly associated with kindred epigenetic occurrences of zinc and uranium.

South of the boundary, Copperbelt mineralization is confined to a Lower Roan horizon, uranium and zinc are negligible, and the deposits, in simple pitching folds, are more regular and have demanded underground mining methods from the start.

Controversial genesis

The boundary line has also, academically, separated the epigeneticists of the North from the syngeneticists of the South. But the former now

Sub level and caving methods used underground...bucket wheel

Once a spearhead of mining development, the Copperbelt has become a center of national expansion. On capital and working cost account, the mining companies alone have expended to date some $2,500,000,000. Political uncertainties have not yet checked expansion. In the last few years, two new mines have been established—the Bancroft and Chibuluma; open-cast mining on a big scale has started at Nchanga; a new refinery has been built at Ndola; Mufulira has initiated a 50 percent expansion scheme and all shortages of electric power have been overcome.

The six producing mines are controlled by two groups with administrative headquarters at Salisbury. Anomalously, the Anglo-American Corporation is South African in domicile, where the Rhodesian Selection Trust is of truly Anglo-American origin. Differences of policy or approach are disclosed in minor administrative contexts rather than technical affairs, e.g. only Anglo-American publishes mine plans, Rhodesian Selection Trust declares quarterly results, etc. At the mines, the spirit of close cooperation has long prevailed without detriment to keen technical competition. (See table for reserves).

Against the average ore reserve grade of 3.5 percent, the yield is 2.6 percent, but no direct relationships can be presented. Segregations of ore do not always allow working to average grade. At Bancroft, for example, sound economics have led to the mining of the richer, southern deposit, leaving the Konkola, linking with Union Miniere's Musoshi, for a much later day. Nchanga's new open-pit averages 2.6 percent copper against mine workings twice as rich.

An Analysis of the Mines in the Two Major Groups in Northern Rhodesia's Copper Belt

	Ore reserves		Yearly Production	Mill head grade
	Tons	Percent	short tons copper	percent
Anglo-American Corporation				
Rhokana*				
(Nkana-Mindola)	124,000,000	3.1	90,000	2.5
Nchanga				
(Nchanga, N. West, Chingola)	167,000,000	4.7	140,000	5.1
Bancroft				
(Kirila, Konkola)	105,000,000	3.8	(50,000)	4.4
Kansanshi	Flooded, awaiting policy			
Rhodesian Selection Trust				
Group Totals				
Roan Antelope	396,000,000	3.9	280,000	
(Roan-Roan Extension)	96,000,000	3.1	88,000	1.95
Mufulira				
(Mufulira, M. West)	177,000,000	3.3	100,000	2.6
Chibuluma*				
(Chibuluma-C. West)	10,000,000	5.0	22,000	4.6
Chambisi	35,000,000	3.4	Undeveloped	
Baluba	112,000,000	2.4	Undeveloped	
Group Totals	430,000,000	3.1	210,000	
Copperbelt Totals	826,000,000	3.5	490,000	

*Cobalt producer

Mining conditions

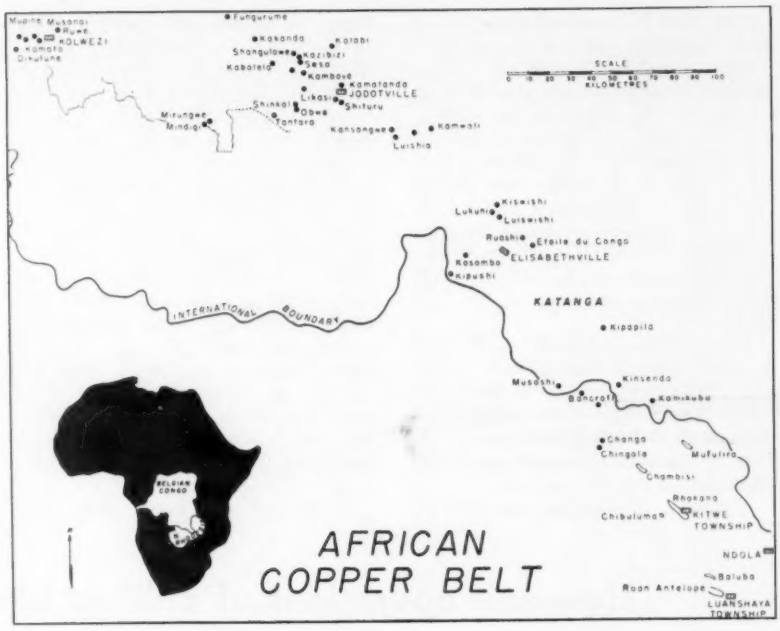
The Lower Roan series consists of a wide variety of shale, quartzites, conglomerate, arkose and grits, some highly felspathic. Dolomitic beds above the orebody are heavily water-bearing.

The orebody itself—rarely termed the "lode"—is mostly a laminated argillite, with copper sulphides below the oxidized zone in finely disseminated particles. In some places there is a marked zoning of the sulphides in the order: chalcocite, bornite, chalcopyrite and pyrite—from hanging to foot and laterally toward the fringes of pay ore. In the leached zones, the so-called "oxides" are malachite, azurite, chrysocolla and cuprite.

Water and mud, and metallurgical

Methods

seem to be spreading victoriously over the border. The hydrothermalists, drawing mineral-bearing solutions from unknown magmatic sources, are gaining ground. The ghosts of busy anaerobic bacteria are no longer allowed to float around the migrant shorelines. Nevertheless, the mining engineer clings stubbornly to the simple picture of coincident deposition of the copper and enclosing sediments. Otherwise, he can not conceive such amazing uniformity of mineral content confined to narrow or poorly permeable argillaceous beds. Whatever the origin, ore continuity is important.



used at a new pit

difficulties were responsible at Nchanga for long delaying the success of this spectacular mine. At Bancroft, rock conditions were even worse.

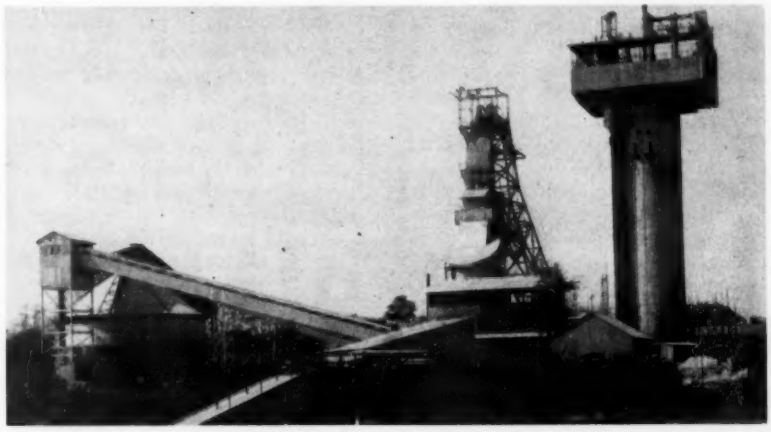
Extreme differences in dip and widths of the orebodies are to be expected in the synclinal and anticlinal remnants composing the field. Average figures would have no meaning.

Typical conditions for Nkana-Mindola and for Roan, outside the folded sections, would be a width of 20 to 30 feet and a dip of 60 degrees. Nchanga West, with a moderate dip and wide ore body is ideal for block caving. The dip of about 45 degrees at Mufulira is associated with irregular widths, notably where three beds, over extensive areas, join up to make single stopes of up to 200 feet wide.

Apart from copper, the only metal of industrial significance is cobalt, in the form of carrollite. Ore reserve values, which cannot be worked selectively, are about 0.2 percent cobalt at Rhokana and the neighboring Chibuluma. The undeveloped Baluba, in the Roan syncline, shows 112,000,000 tons at 0.16 percent cobalt, probably unique as an undeveloped deposit of cobalt ore.

Main shafts and hoists

Until recent years, main shaft and winding engine types have been fairly uniform throughout the copperbelt. The so-called "square" shafts, well in the footwall, have been 20-25 feet by 14 feet wide, equipped with two 8-10



NEW 22-FOOT CIRCULAR SHAFT at Mindola will be serviced by a friction hoist.

An Analysis of the Mining Companies and Their Operations in the Copperbelt

Bancroft Mines, Ltd. Box 1, Bancroft. A. J. Bring, general manager.
Holds special mining grants over 63,000 acres and leaseholds surface rights over 57,600 acres. First mining in January 1957.

Chibuluma Mines Limited. Kalulushi. R. Cornthwaite, manager.
Holds special mining grant on the Nkana South Limb. First mining in 1956.

Mufulira Copper Mines Limited. Mufulira. F. E. Buch, general manager.
Special mining right grants in Luangwa district. First production in 1933.

Nchanga Consolidated Copper Mines Limited. Box 63, Chingola. K. E. Mackay, manager.
Special mining grants over 36,100 acres in Chingola district.

Ndola Copper Refineries Limited. Lusaka. C. W. Nightingale, manager.
Refines Roan Antelope Copper Mines' blister. First production in late 1958.

Rhodesia Copper Refineries Limited. Nkana.
Refines blister from Rhokana Corporation.

Rhokana Corporation Limited. Box 137, Kitwe. O. B. Bennett, general manager.
Holds mineral rights over 52 square miles in Nkana district. First copper output in 1932, cobalt in 1933.

Roan Antelope Copper Mines Limited. Luanshya. J. L. Reid, manager.
Mining leases cover 10,803 acres in Luangwa district. First production in 1931.

tons skips in balance and a multi-deck cage (running against a counterweight) capable of carrying underground locomotives and similar units for repair. The old Rand rectangular is represented at Nkana's central 5-compartment shaft, 35 feet by 9 feet excavation. These shafts have served conditions well to about 2,000 feet, followed by sub-verticals or by sub-inclines as at Mufulira, where 35 degree inclines are put down from 1,700 feet, following the rake of the ore body.

Bancroft, exceptionally, will carry its main vertical shaft to only 1,300 feet. Twin inclines to a depth of 2,600 feet will give single-point vertical shaft loading and the avoidance of some troublesome ground in sinking.

Advances of practice are seen at Roan's new MacLaren shaft and the Mindola No. 2. The MacLaren is a 22-foot lined circular shaft going to 4,000 feet for service and ventilation —only the bottom half being used for rock-hoisting to a haulage level.

Mindola No. 2 is a 24-foot circular shaft to deal with a possible monthly tonnage of 300,000 from a 3,000-foot level. Bottom dump 15-ton skips will be run in balance on rope guides, while buntons on one side of the shaft will carry service-cage, pipes and cables. The Koepe hoist, mounted on a concrete headgear, will be well suited to these conditions. However, at very great depths, Keope ropes may give trouble at the sheaves. Loading and hoisting will be automatic, facilitated by underground crushing to give a uniform feed.

Another Koepe hoist, with automatic controls, is in service at the Bancroft mine, for a single man-cage and counterweight. A Koepe would probably have also been installed for the skips, had underground crushing at a single loading station been designed initially.

The great majority of main hoisting shafts throughout the Copperbelt are equipped with winders of the Ward Leonard Ilagner type, while A. C. winders serve the smaller shafts, on surface and underground.

Shaft-raising, with the cage system, was chiefly used on Mindola No. 2 shaft and has gained wide popularity where underground accessibility allows.

Main haulages from the vertical shafts are roughly 240 feet apart and connect with lateral haulages (11 feet by 11 feet), 40 to 50 feet below the

How unit operations of drilling, blasting, ventilation and

Physical differences are quite enough to account for the divergences of stoping practice, but not for the varying applications of rotary and percussion machines in the long-hole drilling. Study and debate of the problems continue. The trend of opinion has been influenced by improvements in tungsten carbide bits, in extension rods and couplings, in the toughness of matrix and setting of diamond bit crowns.

Roan, quite a pioneer of diamond drilling at one time, has reverted to full percussion drilling, with 2-inch or 2⅛-inch cruciform T. C. bits, for all stope and pillar longhole work.

Rhokana uses diamond drilling for down-holes and all slot-holes—thus an individual round may involve both methods.

Nchanga uses chiefly percussion, while Bancroft—entering the field with all the accumulated experience of the other mines for guidance—uses diamond drilling with its admitted superiority in long down-holes and in control of direction. Percussion drilling however, is definitely faster and cheaper. Even Mufulira, with its hard, abrasive ground, is now introducing that method. The question of comparative deflections in a 50-foot hole is being further studied and the protagonists of percussion drilling hope to prove that the case against them in that connection has been overstated.

Drilling practice in development is normal. Some 2,000 rock drills are in use in the field, of which 70 percent are jackhammers, with various types of legs. In this work, the African laborer excels.

Few important changes underground have taken place over the years. Manual ignition of fuses in development has given way to igniter cord. Fuses cut to length, and fitted with detonators or igniter cord connectors and primer clips, are issued from the South African factory. At drawpoints and grizzlies, 8-ounce "slab" cartridges are used to advantage on all mines.

Nearly all long stoping holes are charged with 60 percent ammon gelignite 22-inch cartridges, primered with Cordtex detonating fuse. For "rings" of holes, short-delay detonators are preferred. In up-holes and dry places, ammon dynamite is sometimes used for economy.

In the Nchanga open pit, blasting of ore is undertaken with groups of 3½ inch diameter holes, 30 feet deep, primered with Cordtex throughout the length. "Freflo," a free-running granular explosive, similar to ammon dynamite and helpful if holes are ragged, may be used alone or in combination with the principal charge of ammonium nitrate/fuel oil mixture. Because of lower factory price and rail charges, this mixture is economical and convenient. The ammonium nitrate is not stored in licenced magazines. Mixing is performed on the site. The slow heaving effect of the mixture on the ore results in a condition of broken ground conducive to good-power shovel efficiencies.

With the unfavorable geothermic gradient of 1 degree F. per 102 feet vertical depth, ventilation demands have inevitably become steadily more exacting. Furthermore, secondary blasting at drawpoints is heavier, particularly with block caving. Bigger volumes of air have been needed to check the incidence of silicosis, more evident among white employees because of longer and less-broken service. Dust counts average 200 pp.cc., though much higher in ore-handling drifts, from which exhaust air is either filtered for recirculation or passed up cast outlets.

Main fans on the Copperbelt number 40, with a combined capacity of 7,000,000 c.f.m. and about 1,700 subsidiary units circulating air to the working faces.

The 214-inch diameter Aerex axial-flow fan at the main up-cast shaft at Mufulira, with vertical spindle, passes 1,000,000 c.f m at 5 inch WG and is probably the largest of this type in the world.

Annual rainfall, during the five-month wet summer season, exceeds 40 inches. Heavy inflow of water into the mines has always been the Number One menace. Total pumping on the six producers exceeds 80,000,000 gallons per day.

Advancement to depth has depended upon good control of water well below the mining levels. Water tunnels are run out to tap the dolomitic beds, chiefly overlying the orebody. Pilot and bleeder holes, up to seven inches, are used, but sometimes choke in the unstable beds.

Nchanga and Bancroft have had the hardest struggles against both mud and water. At Nchanga West, an incline pumping shaft, unconnected with the mine workings, serves a main pumping station at 2,200 feet, far below the lowest haulage levels.

Muddy water from the broken ore

ore body. Ore transport is mostly by electric trolley locomotives and 180 cubic foot Granby-type cars. At Bancroft, Diesel locomotives are used, with a repair shop on surface.

Of the 200 miles of annual development, over 80 percent is in stope preparation—a heavier expense for conventional sublevel stoping than for block-caving methods, with the wider stope widths. Over 20 tons of ore are mined per foot of total development in both systems.

Mufulira was considered too steep, at 45 degrees, for block-caving and Rhokana too narrow, at around 20 feet, for good sub-level practice. Great success has nevertheless been gained. Favorable rock conditions and commonly big widths at Mufulira allow the hanging wall pressure to do most of the work, and today only 20 percent of the ore is won by open-stoping at that mine.

Early stoping methods, imported from America and labelled "Climax" or other names, have been modified empirically and are now too variant for summarization. Practice at Rhokana, along eight miles on strike may be cited. Typically, a stope would be 270 feet long from haulage to haulage, 50-60 feet on strike, 20-30 feet wide except for folds, and with a 15-20 foot rib pillar. The dip is roughly 60 degrees. Sub-level development for long-hole stope blasting involves a grizzly level, 50 feet above the haulage level, of twin drives—one in ore and one in footwall. Twenty feet above that is a chamber level in ore, followed up-dip by 3 stope—or pillar-drilling levels, about 55 feet apart. In each stope block, an ore raise is put through for slotting, and long-holes in rings or fans are drilled from the security of the drilling levels. This method aims for the production of upwards of 20,000 tons per month Ore chutes are 50 feet apart on the haulage levels, and draw-points, 25 feet.

A million tons of ore are now produced annually by opencast working. The rich Chingola pit, stripped on contract, follows conventional methods; while the Nchanga pit, 4,000 feet long, uses the 400-ton Lubeck Bucket-Wheel excavator, conveyor belt system and stocker as described in MINING WORLD February 1959. This economical layout, in which the ore is tipped to an underground haulage from Nchanga West, continues to give great satisfaction.

mine drainage are carried out at underground mines

is very hard on pump impellers. At Bancroft, the coarser solids are being removed by hydraulic cyclones. Centrifugal pumps of about 2,000 gallons per minute capacity and 1,000 h.p., water-cooled motors are widely used.

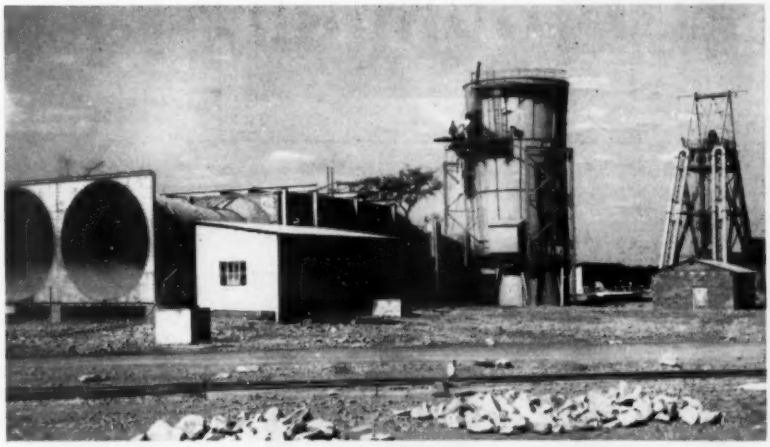
Power consumption, now about 70 kwh per ton milled, will steadily increase.

Supply is controlled by a cooperative corporation run by the groups, drawing electric power from the thermal generating stations at the mines and redistributing it through a 66,000 volt grid. In addition, power has been heavily imported by a 330,000 volt line from Union Miniere's Marinel hydro-electric station.

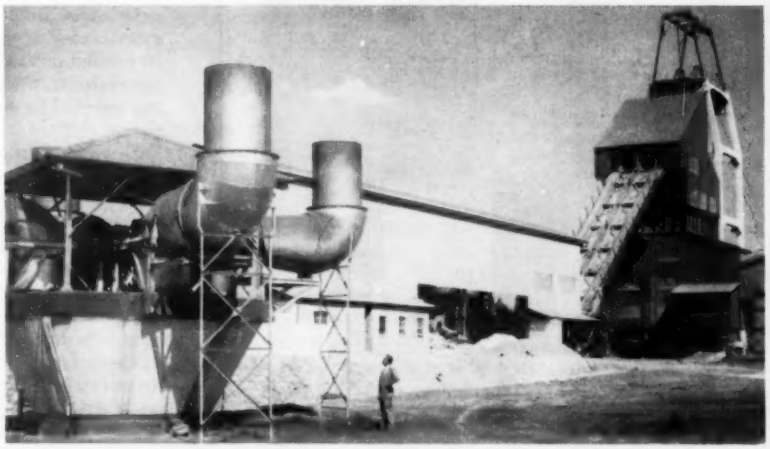
The Copperbelt has first call on power from the new $250,000,000 station at the Kariba dam. This record-breaking artificial lake, ultimately 2,000 square miles in area and 140,000,000 acre-feet in volume, is already one-quarter full. The first of six 100 MW turbo-generators was started last January, serving the mines through conductors of steel-cored aluminum—a constant warning to Rhodesia of ill consequences should the price of copper be allowed again to run too high.

Power charges from Kariba will be high for sometime, but in ten years, the cost of production should be around 0 30 cents per kwh.

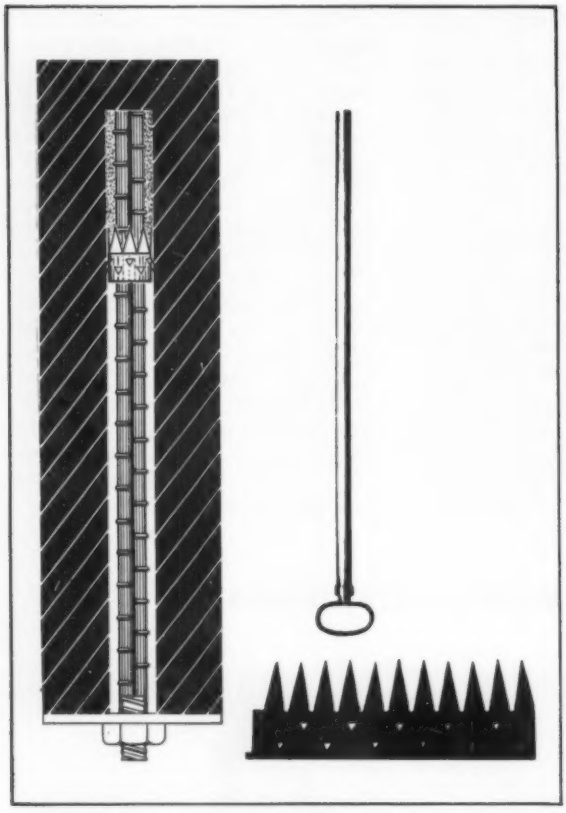
Compressed air for the mines is produced mostly by steam or motor-driven turbo compressors. Cost of thermal power at Roan, Rhokana and Mufulira is greatly reduced by good utilization of waste heat from the reverberatory furnaces. END



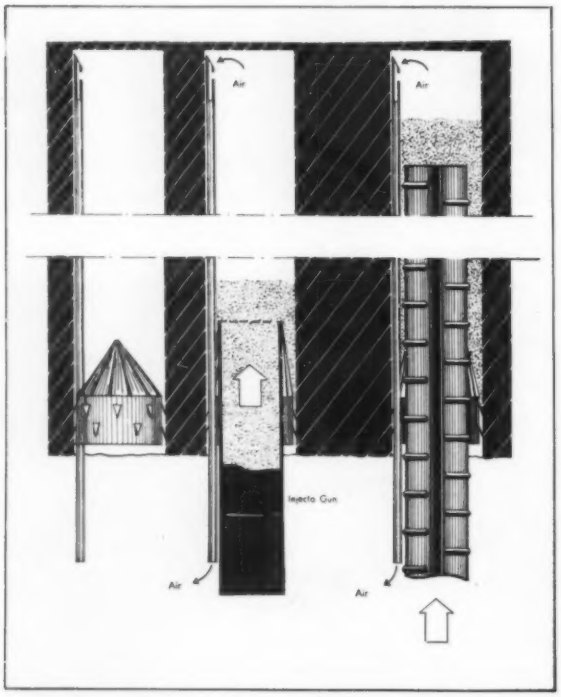
UP-CAST SHAFT at Mufulira is equipped with 214-inch, 1,000,000 cfm axial flow fan.



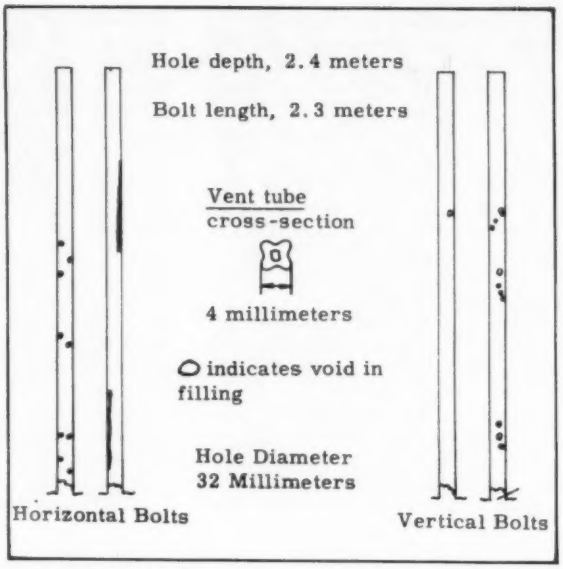
VENTILATION FANS at the inclined shaft of Chibuluma copper-cobalt mine.



INJEKTO GUN (right) with the steel nozzle make it possible to cement any part of bolt in hole as shown at left.



THREE STEPS in use of injekto rock bolting showing the vent tube, injekto nozzle, and ribbed steel bolt.



FILLING DENSITY of rock bolt holes at Kiruna was determined by measurements of vertical and horizontal holes.

Kiruna Cements All

By H. W. Kroc, mining engineer,

The injekto system of rock bolting has proved to be the best method for fastening steel bolts at the Kiruna iron ore mine in northern Sweden.

With this system the steel bolt is cemented in the hole with any of several cement-and-chemical grouting mixtures. Three pieces of special equipment are used to place grout in hole, keep it in the hole, and bleed off air from bottom.

More than 100,000 bolts have now been placed by this method at Europe's largest underground mine operated by Luossavaara-Kiirunavaara Aktiebolag.

Following scores of tests using many different methods and types of bolts over a two-year period proved to the engineering staff that this method was superior to all others and it has now been adopted as standard.

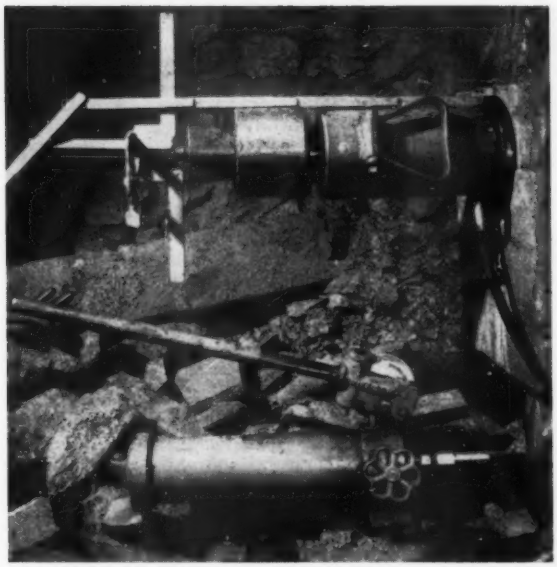
Before the tests started the engineering staff established the following criteria for rock bolting: Bolting equipment would have to be simple to operate, such equipment would have to be high quality for minimum repairs or replacement, and it would have to be portable so that bolting could be carried out with a minimum of time as the heading was being driven. A special demand was placed on any cementing material to be used with the bolt—corrosion over a long period of time would not affect the strength of the bolt.

Holes are drilled and washed clean for injekto bolting the same as for other types of bolts. However, the method does require three separate special pieces of equipment: 1. the nozzle, 2. vent tube, 3. cement gun.

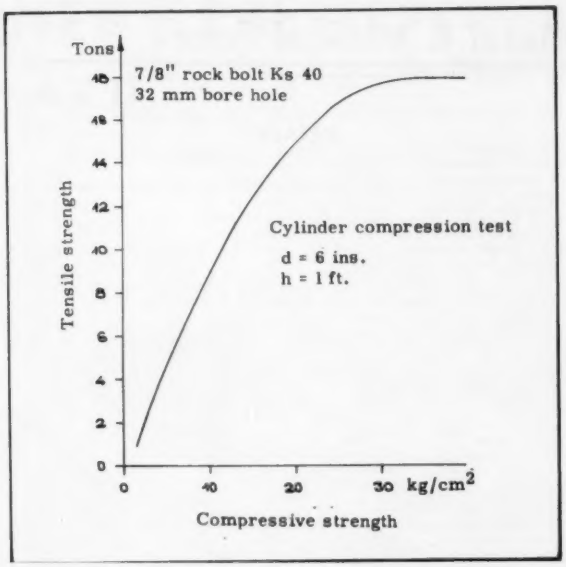
The gun is reused for many holes while every hole requires that both a nozzle and tube be cemented in place.

The nozzle is a strip of hardened steel 0.15 to 0.20 millimeters thick depending on the diameter of the hole. The strip length can also be varied to confirm with the circumference of the hole. The top edge of the nozzle is separated to form a series of "v's." The main section of the nozzle has a series of flaps formed by slitting a series of "v"-shaped holes in the metal.

The vent tube can be either plastic or brass. Kiruna has



HYDRAULIC JACK used to determine force necessary to remove rock bolts placed by the injekto method.



TENSILE-COMPRESSIVE strength diagram between steel bolt and concrete bond shows curve for average conditions.

Rock Bolts in Holes By Injekto Method

Luossavaara-Kiirunavaara, Aktiebolog, Kiruna, Sweden

standardized on a rigid plastic tube of special shape whose cross section resembles a four-leaf clover (See diagram above). The manufacturer supplies straight tubes in bundles of 100. Price per tube is about two cents per foot.

The gun is of simple construction and dimensioned to hold the exact amount of cement grout needed per bolt. It is not necessary to dismantle it for cleaning; flushing with water is sufficient.

The nozzle serves two purposes: To hold the tube in position and prevent it from falling from holes drilled in the back, and to form a tight seal between bolt and wall of the hole so that the cement will not run out of the hole.

The vent tube is the passageway for air to escape from the bottom of the hole as it is displaced by the cement. Removal of air prevents air pockets in the grout which normally would form as the bolt is pushed into the grout with sufficient pressure to force water out of the grout. This means that the grout maintains a uniform consistency and adheres closely to the bolt for its entire length to form a much stronger bond between wall and bolt.

Bolting starts by inserting a plastic tube to the bottom of the hole. The nozzle is rolled into a loop by hand and inserted in the hole with the large V's at top. The spring in the steel clamps tube firmly in place against the wall. Grout is then forced into the hole. As bolts are standard lengths of 1.5, 2.3, and occasionally 4.0 meters the exact amount of grout per hole is known and the appropriate gun filled accordingly. Thus, there is no trouble or loss of time in measuring amount of grout needed.

The final step is to push the bolt into the hole by hand as far as it will go. The top "v"-like fingers spring tightly around the bolt and the serrated grooves hold nozzle tightly against rock so that there is no leakage of grout. The bolt is then driven home by an ordinary rock drill fitted with a special attachment. Thus, the grout is vibrated under pressure to completely fill all voids to provide a bubble-free, cohesive, homogeneous cement mixture around the bolt. This secures the bolts so firmly that any wire mesh fabric needed can be secured immediately.

Kiruna engineers have found that one of the chief advantages is that the cement around the bolt can be kept very thin which permits efficient utilization of the volume of the hole. It takes only a few minutes to grout a bolt, but in connection with other work efficiency averages only one bolt per working hour. General practice in Sweden is to use ⅞-inch diameter deformed bars with 2.0 to 3.0-millimeter ribs for hole diameters less than 30 millimeters.

When time is unimportant the cementing mixture may consist of equal parts of Portland cement and abrasive sand. For quick setting it is necessary to use special cement or to add some chemicals. At moderate temperatures quick setting cement will give a full strength bond after about eight hours.

In tensile tests of 42 bolts at a temperature of plus 3° C, measured in the holes, a quick setting cement grout attained full strength only after 24 to 30 hours. Considerably longer bonding times were recorded when chemicals were added to ordinary Portland cement.

A Swiss bonding agent is now used, known as Sica-3. It is a liquid and can be diluted with water. The grout is then prepared in the normal manner. The agent is very popular with the bolters since it makes a smooth and easily worked grout. Because only a small quantity is required per bolt the addition to the reinforcement cost is very low.

With Sica-3 diluted with twice its quantity of water full strength has been attained after 8 to 10 hours with bolts 2.3 meters long at a temperature of plus 3° C. Quicker bonding times can be obtained, even at lower temperatures, by diluting with less water.

The tensile-compressive strength diagram above has been plotted as an aid in finding the correct proportion for particular conditions. The curve has been drawn with a certain safety margin to allow for differences in bond in the case of large diameter holes. END

Metal & Mineral Prices

U.S.A.

METALS

July 22, 1960

COPPER: **Electrolytic.** Delivered F.o.b. cars, Valley basis (pound) ..... 33.00¢
Lake. Delivered, destinations, USA ..... 33.00¢
Foreign. Delivered, destinations, USA ..... 33.00¢
LEAD: **Common Grade.** New York (Per pound) ..... 12.00¢
Tri-State Concentrate, 80% lead, per ton $141.72
ZINC: **Prime Western:** F.o.b. E. St. Louis (Per pound) ..... 13.00¢
Prime Western: Delivered New York ..... 13.50¢
Tri-State Concentrate, 60% zinc per ton $80.00
ALUMINUM: **Primary 30 Pound Ingots (99.5% plus)** (Per pound) 28.10¢
ANTIMONY: **Lone Star Brand. F.o.b. Laredo, in bulk** (Per pound) 29.50¢
BISMUTH: (In ton lots) price per pound $2.25
CADMIUM: **Sticks and bars.** 1 to 5 ton lots Price per pound .. $1.50
COBALT: **97-99%,** keg of 500 pounds (Price per pound) $1.50
COLUMBIUM: **Ingot** ..... Nom., per pound $55.00-$85.00
GERMANIUM: dioxide, high purity, gram ..... 29.95-36.95¢
LITHIUM: **98%** (per pound) ..... $9.00-$12.00
MAGNESIUM: **Ingots (99.8%)** F.o.b. Velasco, Texas per pound 36.00¢
MERCURY: **Flasks.** Small lots, New York ..... $210.00-$212.00
NICKEL: **"F" Ingots (5 pounds).** F.o.b. Port Colbourne, Ontario 75.50¢
PLUTONIUM: To July 1 1962 AEC will pay $30.00 to $40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram $30.00
SELENIUM: **99.5% per pound** $7.00
TELLURIUM: Common grade, Per pound $3.50
THORIUM: per kilogram $43.00
TIN: **Grade A Brands.** New York (Per pound) Prompt delivery 103.375¢
TITANIUM: **99.3%** + Grade A-1 Sponge (Per pound) ... $1.50-$1.60
URANIUM: **Rod** (0.790 U-235) $16.00 Per Pound; Foil $16.75
U-235: **Nominal** (Per pound) $7.725
GOLD: **United States Treasury Price** ..... $35.00 per ounce
SILVER: **Newly mined domestic.** U.S. Treasury price per ounce 90.5¢
Foreign Handy Harmon ..... 91⅜¢
PLATINUM: Per ounce ..... $82.00-$85.00
ZIRCONIUM: **Sponge,** Per pound, Reactor Grade $5.00

ORES AND CONCENTRATES

BERYLLIUM ORE: **10 to 12% BeO.** F.o.b. mine, Colorado $46.00 per unit Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $48.00.
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons.
African (Rhodesian). 48% Cr_2O_3. 3 to 1 Ratio ..... $35.00-$36.00
African (Transvaal). 48% Cr_2O_3. No ratio ..... $26.00-$28.00
Turkish, 48% Cr_2O_3. 3 to 1 chrome-iron ratio Nominal $36.00-$37.00
U.S. Government ore-purchase depot Grants Pass Oregon. Buying suspended, quota filled.
COLUMBIUM-TANTALUM ORE: Per Pound Pentoxide Nominal $1.10
IRON ORE: **Lake Superior. Per gross ton Lower Lake Ports**
Mesabi, Non Bessemer, 51.5% Fe $11.45
Mesabi, Bessemer, 51.5% Fe $11.60
Old Range Non Bessemer $11.70
Old Range Bessemer $11.85
Lump: Plus ½-inch $12.85
Fines: Minus ½-inch $10.72
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit ..... 24.00-25.00¢
MANGANESE ORE: **Metallurgical grade.** 48 to 50% Mn Long ton unit ..... $0.95-$1.00
Metallurgical grade. 46 to 48% Mn. Long ton unit .... $0.90-$0.95
Metallurgical grade. 44 to 45% Mn. Long ton unit .... $0.85-$0.90
Domestic U.S. Government. GSA Basis $2.30 per unit for 48% Mn.
MOLYBDENITE CONCENTRATE: **90% MoS_2 F.o.b.** Climax, Colorado. Per pound Mo, plus container cost $1.25
TUNGSTEN CONCENTRATE: **Domestic.** 60% WO_3 Per short ton unit ..... Nominal $24.00
Foreign: 65% WO_3 Per short ton unit (Scheelite) .. Nominal $20.25
Foreign: South American, Spanish, Portuguese .... Nominal $20.00
URANIUM ORE. F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is $1.50 per pound of U_3O_8 in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.

NON-METALLIC MINERALS

BARITE: Oil well drilling. Minimum **4.25 specific gravity,** per short ton $16.00
BENTONITE: **Minus-200mesh.** F.o.b. Wyoming. Per ton, carload lots $12.50
Oil Well grade. Packed in 100 pound paper bags $14.00
BORON: technical grade .. F.o.b. Boron California. Per ton .. $47.50
FLUORSPAR: **Metallurgical grade.** 72.5% effective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines ..... $37.00-$41.00
Mexican. 70% F.o.b. border ..... $26.00-$27.00
Acid Grade. 97% CaF_2 Bulk, F.o.b. mine ..... $45.00-$49.00
PERLITE: **Crude:** F.o.b. mine per short ton ..... $3.00 to $5.00
Plaster grades. Crushed and sized. F.o.b. plants .... $7.00 to $9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas .... $22.50-$23.50

London

July 22, 1960

		Per Long Ton	USA Equivalent	cents per pound*
COPPER:	Electrolytic spot	£254	0s 0d	31.75¢
LEAD:	Refined, 99%	£ 70	17s 6d	8.86¢
ZINC:	Virgin 98%	£ 90	5s 0d	11.28¢
ALUMINUM:	Ingot, 99.5%	£186	0s 0d	23.25¢
ANTIMONY:	Regulus, 99.6%	£197	10s 0d	24.69¢
TIN:	Standard, 99.75% ...	£810	0s 0d	101.25¢
TUNGSTEN:	Long ton unit	159s		$22.40¢

*With Sterling Pound at $ 2.80

Quotations on metals and certain ores through the courtesy of *American Metal Market, New York, N. Y.*

Truck Talk

by Chet Cunningham

A new gas turbine engine aimed especially at mining and other off-the-road uses should be ready by November from the Boeing Airplane company in Seattle, Washington.

This new turbine engine turns out 420 horsepower and will be the first of a whole line of gas turbine engines from 240 hp up to 550 hp.

The turbine works as any other gas turbine. Air is sucked in and compressed. It passes to a combustion chamber where it joins the fuel supplied under pressure by a fuel pump and governor unit. Combustion of the fuel-air mixture is continuous after it begins. The hot gases from combustion expand to the end of the combustion chamber where they spin a "first stage" turbine wheel. This runs the intake air compressor. The hot gas then moves on to a second stage turbine wheel, which powers, through reduction gearing, the engine's output shaft.

The Boeing turbine uses a 24-volt 30-amp starter generator unit with a negative ground circuit. Ignition is used only during starting. The continuing ignition of the air-fuel is through a capacitance-discharge ignition unit and two vaporizing-type spark plugs. The engine is adjusted to operate on diesel fuel or its commercial equivalent. Because of the gas-driven turbine principle, the engine automatically becomes a torque-converter type of retarder for downhill braking.

Use some type of chemical oil analysis on your mining equipment and every oil-serviced engine in your operation to save money on oil, oil filters and oil change labor. Today, with simple in-your-shop analysis practical, no mining outfit should do without it. This analysis means you can get almost 100 percent utilization from your motor oil.

There are many oil evaluation methods and makes on the market. One of these is the Shell ADC Oilprint Analysis. This system uses a simple chemical reaction principle, a special filter paper, two drops of crankcase oil and an indicator solution. You take two drops of oil from the crankcase and put one drop on each of the two types of filter papers. The oil diffuses, then is ready to read. It shows three things:

- Whether the oil is too dirty to continue using.
- Whether the oil has glycol, water or other contaminants in it making it ready for change.
- Whether the oil additives have been used up turning your oil base back to acid, which means excessive engine wear.

By using some type of oil analysis, and checking each engine every week, you can know almost to the mile when that engine's oil needs replacing for any of the above three reasons. That will mean increased oil utilization—lower operating costs.

Be sure the brake fluid in your mining trucks is adequate. Right now there is only one fluid approved by the Society of Automotive Engineers. That is "SAE 70-R-1." This heavy duty brake fluid has a boiling point of 300 degrees. There are many fluids on the market that do not measure up to the SAE's recommendation for safety. Only 13 states have legislation preventing the sale of substandard brake fluid. How about your state? Check and be sure that the fluid in your shop shows the label "SAE 70-R-1." It is made by all leading manufacturers of brake fluid.

PRODUCTION EQUIPMENT PREVIEW

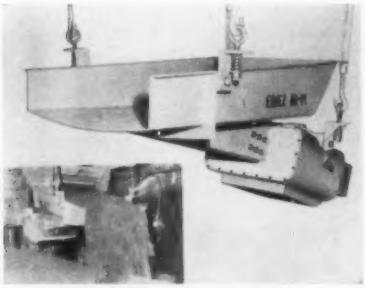
For data on any item on next three pages use the inquiry card opposite page 40

Large Capacity Self-Loading Tractor-Scraper Combination Introduced

A new, efficient, large-capacity self-loading tractor-scraper combination is being introduced to the market by LeTourneau-Westinghouse Company, Peoria, Illinois, and the Hancock Manufacturing Company, Lubbock, Texas.

Built essentially for jobs where self-loading is mandatory, the Hancock Elevating Scraper, 10 cubic yard Model 10E2, will load in surprisingly short time under moderately difficult conditions, because of the exclusive "chopping action" of the slat-type elevator. This elevator, driven by LeTourneau-Westinghouse motors, chops and pulverizes the material and carries it rapidly off the scraper blade high into the bowl, to give this scraper its high dirt-moving capacity. This soil-pulverizing action makes spreading easy and uniform and eliminates the need for a separate finishing tool.

Smallest of the line of LeTourneau-Westinghouse Tournapulls, the "D" is a fast, powerful machine perfectly teamed to the Model 10E2 scraper which was built exclusively as a part of this combination. The Model D 'Pull, with its GM 4-71, 143 hp engine is capable of haul road speeds up to 30 m.p.h. Circle No. 74.



Big Capacity Vibratory Feeder

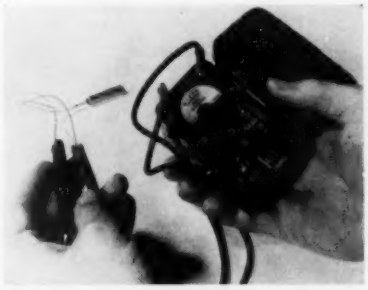
A new heavy-duty unit has been added to their line of Hi-Vi Vibratory Feeders by the Eriez Manufacturing Company, Erie, Pennsylvania. This new model, the 75A, is of special interest to such industries as ceramics, rock products, mining, etc. because it has been designed to handle a great diversity of materials in a wide range of particle sizes.

The 75A has a rated output of 75 tons per hour when operating level. This can be substantially increased when the Feeder is operated downslope. It is available as either a suspended or a base mounted unit. Circle No. 73.

New Utility Dozers Offered

New higher-output Case Utility dozer units—with power-angling or power-tilt blades—are now being offered by J. I. Case Company, Racine, Wisconsin. Jobproved for over three years on larger Case industrial crawler tractors, these hydraulic-powered blades are now offered mounted on 42 hp Case Model 310 Utility crawlers.

Case 310 Utility Power-Angling Dozer allows operator to angle the blade 25 degrees left or right without having to stop the tractor and wrestle the blade into correct position by hand or other means. Circle No. 72.



New Pocket-Sized Tester

Explosive igniters, detonators, primers or squibs may be checked quickly and safely with a new tester developed by Kinetics Corporation of California.

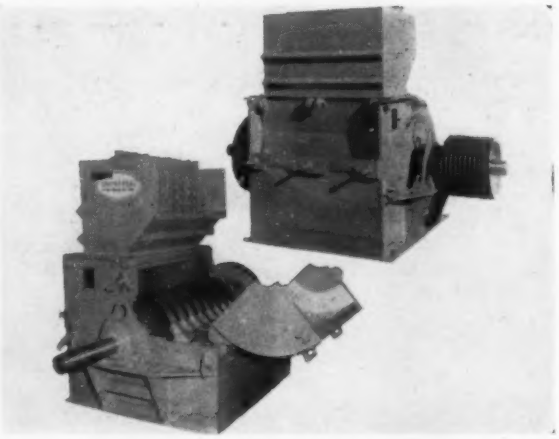
To save expensive explosives and for safety reasons, all igniters should be checked on a tester before use. Manufacturers of devices used to set off explosives specify the electrical resistance the device should have to insure proper operation. A simple digital readout on this instrument will indicate whether the device will operate a sensitive bridge circuit. Maximum test current is limited to 10 millamperes. Circle No. 71.

New Hammermill Design Introduced

A new hammermill, designed to provide close product control, eliminate excessive fines, has been introduced by Universal Engineering Corporation, Cedar Rapids, Iowa.

Highlight features of the new Hammermaster, as the new hammermill is called, are its larger hammer circle, new breaker plate design, and larger hammers. The larger hammer circle permits unrestricted penetration of in-fed rock, into the hammer circle where square impact blows of the hammers produce a more cubical product, important in the reduction of fines. In addition, the larger hammer circle permits slower speeds which reduce horsepower requirements and let the sized material get through the grates before excessive grinding can take place.

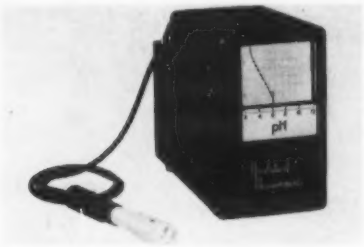
A newly designed breaker plate permits fast and positive adjustment for controlling product size. This plate directs material into the grate area and hammer path for secondary breaking. The shorter design also provides more room for additional grate openings. Faster sizing and faster discharge are a result of this new design. Circle No. 81.



Alloy Steel Producing USS T-1

Alloy Steel and Metals Company of Los Angeles, California, became the world's first foundry to be licensed by United States Steel Corporation to produce USS T-1 steel in the form of castings to give design engineers a versatile new tool for improving the service life and operating economy of many types of industrial equipment.

In plate and bar form, T-1 steel has long been noted for its outstanding combination of strength, toughness, field weldability and resistance to wear and corrosion. Widely used in leading makes of mining, construction, logging, transportation, and other equipment subjected to rugged field use parts fabricated from T-1 steel combine minimum weight with maximum service life and maintenance economy. Circle No. 88.



First Recording pH Meter

For the first time, a combined pH meter and strip chart recorder is available at a price lower than most conventional pH meters alone.

This instrument utilizes an electronically modulated amplifier that compensates for line voltage fluctuations and uses standard radio tubes. A strip chart recorder forms the front panel of the instrument and contains a 63-foot roll of chart paper that will last for 31 days at 1 inch per hour. Other chart speeds are available up to 16 inches per hour by a simple gear change. A pressure sensitive coating is used on the chart paper so that annoying ink and clogged pen problems are eliminated. Circle No. 62.

Safety Block Prevents Falls

You can't fall if you wear a Sala safety block. A sudden pull engages a locking device and the rope is stopped in about one foot. With normal movement the rope pulls out and winds up automatically, keeping the rope taut and giving the user freedom of movement with absolute safety. Because of the friction brake on the rope drum in the block there is no jolt on the man in case of a fall. A manual control allows instant stopping. Circle No. 61.

Portable Magnetometer

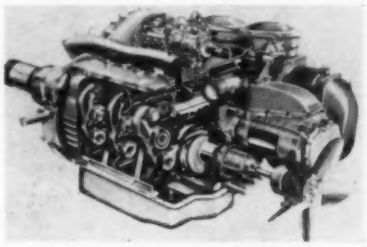
A new "proton free precession" magnetometer, called the Varian M-49, has just been announced by Varian Associates of Palo Alto, California. It is designed for use in geological-geophysical exploration and in other applications where an accurate measurement of the earth's total magnetic field is important. The M-49 is a portable, fully transistorized electronic instrument. The fieldpack weight, including self-contained batteries, the sensing head and connecting cable, is less than 20 pounds.

Utilizing immutable nuclear constants, the M-49 measures the absolute value of the total intensity of the earth's magnetic field with a sensitivity of 10 gammas. By use of eight plug-in tuning units, the range of the M-49 extends from 19,000 to 101,000 gammas, which will cover the normal magnetic intensities encountered throughout the world. Circle No. 87.

Overload Protection System

A new kind of motor overload protection described as simple, positive and fast-acting has been announced by the International General Electric Company, a division of General Electric Company (USA). Trademarked "Thermo-Tector", the exclusive feature is available on all the company's "Tri-Clad '55"-trademark three-phase induction motors up to 125 hp, frame sizes 254U to 445U, in any insulation class or enclosure.

Protection is provided by two or more miniature heat-sensing switches buried in the stator windings. The switches, connected in series with conventional motor control, shut the motor off whenever internal winding temperature exceeds a predetermined amount, regardless of rate of temperature rise. When rapid rise occurs, the Thermo-Tector switches "anticipate" and opens the circuit at a lower temperature than when the rate or rise is slow. Circle No. 90.



Engine Runs on All Fuels

A revolutionary new engine which runs on high or low test gasoline, diesel oil, kerosene, jet fuels or even cleaning fluid is being introduced by England's Rootes Motors. The engine is suitable for use in cars, trucks, busses, tractors, boats, many industrial applications such as electric power generation, and for contractors' equipment.

The basic engine, a two cycle, three cylinder unit, is desigend to deliver 105 brake hp, more than enough for most vehicular uses. Design variations allow 75 and 85 hp ratings also. Circle No. 69.

MORE NEW EQUIPMENT . . . AND NEW LITERATURE

DRILL STEELS treated with the exclusive Sandvik process are protected against corrosion and provide from 30 to 50 percent longer life than untreated steels according to Atlas Copco. Circle No. 1.

CRUSHERS by Sturtevant Mill Company assure long life at top loads for medium and small size plants. Many have operated for more than 25 years without a major repair. Circle No. 2.

UNDERGROUND PUMP that is lightweight, portable and compact that operates with a vane type air motor has been introduced by Boyles Brothers of Canada. It is rugged, self-oiling, and double acting with an output of 825 imperial gallons per hour. Circle No. 3.

VIBRATING SCREEN that handles virtually any type of fine mesh screening is the Leahy No-Blind available from the Deister Concentrator Company. Diffential vibration snaps wedging particles loose 1600 times per minute. Circle No. 4.

CONTROL SYSTEM for conveyor belt feeding, blending, and proportioning is detailed in Bulletin 57A by the Industrial Physics & Electronics Co. CON-O-WEIGH is a highly accurate continuous belt scale for weighing free-flowing bulk materials. Circle No. 6.

VENTILATION TUBING that is tough, durable, easy to install and remove, lightweight, made of long-lasting materials is described in Catalog 59 released by the American Brattice Cloth Corporation. Circle No. 7.

WOOD TANKS AND PIPE that serve modern mining efficiently and productively and give no problems of corrosion or rust are made by Fluor Products Company. Circle No. 8.

LAUGH BOOK containing funny cartoons by famous artists and "Heard-In-The-Locker-Room" jokes has just been published by Precision Equipment Company. This free book is of particular value to those who must make occasional public addresses or speeches. Circle No. 9.

WORM GEAR REDUCERS that combine unlimited flexibility of mounting with high efficiency radiation and convection cooling have been introduced by Foote Brothers Gear and Machine Corp. This new line of fan-cooled drives meets virtually every requirement in the range up to 66 hp. Circle No. 10.

LONG-LIFE BATTERY that delivers 9 to 30 percent more electrical energy than automotive-type batteries, yet is same size, has been developed for light-duty industrial trucks, personnel carriers and other small electrically powered utility buggies. Circle No. 12.

SINGLE ROLL CRUSHER is described in Bulletin 2020 just issued by Pennsylvania Crusher. New "Hercules" model is recommended for heavy duty primary or secondary crushing of gypsum, limestone, ores, shale, slag, etc. Circle No. 24.

ELECTRICAL GENERATING sets engineered to meet continuous high altitude operating conditions has been announced by Freeport Engineering Company, who specialize in generating set requirements for continuous and standby services. Circle No. 25.

CUTTING EDGE replacement seems to come all to soon and too often for many operators. How cutting edge costs can be reduced is the subject of a 12-page illustrated booklet just published by Caterpillar Tractor Co. Circle No. 26.

SCREW CONVEYOR DRIVES are presented in Bulletin 7106 by The Falk Corporation. Applications range from ¾ to 30 hp, in four ratios, designed to bolt to standard trough ends. Circle No. 27.

SAFETY WORK GLOVES of every style and every fabric are described and beautifully illustrated in a new catalog just compiled by the Advance Glove Manufacturing Company. Circle No. 28.

WIRE ROPE SLINGS that offer the flexibility and non-kinking advantages of hemp plus the strength of steel have been introduced by the American Chain and Cable Company. These slings are designed for any application where ease of handling is all-important. Circle No. 29.

AIR COMPRESSORS: A new line of compact, preassembled two-stage rotary compressors, specifically designed to simplify installation and foundation problems, has been announced by the Fuller Company. Circle No. 30.

MANUAL DEL ALUMINIO is the title of a comprehensive 250-page Spanish-language book on the subject of fabricating aluminum recently published by Aluminum Limited of Canada. To obtain your free copy circle No. 31.

PUMPS with extreme thermal shock and corrosion resistance have been placed on the market by Peerless Pump. The complete series of single and multi-stage horizontal pumps cast in ductile iron is described in their new bulletin. Circle No. 32.

BUILDING MAINTENANCE is the subject of a new 28-page manual just published by Johnson's Wax. Detailed information on general maintenance of interior areas of commercial industrial and public buildings is provided. Circle No. 35.

List information you want MINING WORLD to obtain for you on this card. WE'LL DO THE REST. No postage necessary if mailed in U. S.

AUGUST 1960 — **NOT GOOD IF MAILED AFTER SEPTEMBER 25**

CIRCLE NUMBERS OF ITEMS YOU DESIRE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	61	62	63	64	65	66	67	68	69	70
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	71	72	73	74	75	76	77	78	79	80
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	81	82	83	84	85	86	87	88	89	90
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	91	92	93	94	95	96	97	98	99	100

Also send further free information on the equipment advertised on pages:

Pages .....; Product ..... Manufacturer .....

Pages .....; Product ..... Manufacturer .....

Company or Firm .....
(Print Clearly)

To Attention of ..... Address .....

City ..... Zone ..... State ..... Country .....

IMPORTANT: Following information must be given to insure prompt reply:

Nature of your firm's business .....
(Such as: mining, consulting engineers, government, etc.)

Your exact title, job or position .....
(Such as: mine supt., mill foreman, mining engineer, managing director, etc.)

.....

Use this section to subscribe only

Sign here if you wish to subscribe to MINING WORLD .....

☐ 3 years, $8 ☐ 2 years, $6 ☐ 1 year, $4 (Add $1 per year if outside U.S., Canada, Latin America)

ROCK SCREENS for heavy duty performance that screen ore at low cost per ton are described in Catalog 68 by the W. S. Tyler Company. For a free copy circle No. 11.

ACID LEACHING of uranium ore is discussed in technical bulletins C-5001 and C-5005 just issued by Pennsalt Chemicals Corp. The advantages and uses of sodium chlorate and other information is given. Circle No. 13.

SMELTING AND REFINING equipment, and the extensive engineering services available from the M. H. Treadwell Company are described in their Bulletin No. 70. Circle No. 14.

WASTE HEAT PROBLEMS are the subject of The Babcock & Wilcox Company's Bulletin G-88 "Effective Utilization of Waste Heat", which is available to all interested in heat recovery systems. Circle No. 15.

CONSTRUCTION AGGREGATES story is told in an interesting new 52-page booklet titled "Men, Methods & Machinery." Free copies are available in Spanish or English from the Construction Aggregates Corporation. Circle No. 16.

ROOF BOLT MATS for use in mining and construction industries has been announced by Commercial Shearing and Stamping Company. Light, easy to handle and install, the new mat is employed specifically for prevention of rock spalling conditions. Circle No. 17.

PIPE LEAK CLAMP: A new quick-bolting pipe leak clamp and new strip-type gridded gasket with metal backing has been announced by Smith-Blair, Incorporated. The two products permit reductions in repair clamp inventory and can make repairs on any length pipe in multiples of three inches. Circle No. 18.

HYDRAULIC HAND PUMP that is compact and develops a full 8,650 PSI is announced by Owatomma Tool Company. The new pump is 14 5/16" long and has an oil capacity of 13.5 cubic inches. Circle No. 19.

TRACTORS: Production and mechanical advantages of the new Caterpillar D7, D6 and D4 Tractors are discussed in "The Profit Side of Your Ledger," a new eight-page booklet by Caterpillar Tractor Company. Circle No. 20.

FIRE PROTECTION PUMPS that are portable and include a complete range of sizes 1½ inches through 3 inches, have many features such as positive automatic priming by combining a self-priming pump with an exhaust primer are offered by Rice Pump & Machine Company. Circle No. 21.

NEW FLOWMETER introduced by Fischer & Porter Company can be used for both flow and liquid level applications. This differential pressure measuring device is accurate within ¼ of 1 percent using no mercury, seal-pots, purges or stuffing boxes. Circle No. 22.

INDUSTRIAL TRUCK COSTS can be accurately estimated in three minutes with a free 12-page brochure recently issued by the Lead Industries Association. Charts show costs of depreciation, operation, and maintenance accurately for both gasoline-powered and battery-powered trucks. Circle No. 23.

RELIEF VALVES and special service valves are described in a new 28-page color catalog just published by Farris Engineering Corporation. Circle No. 41.

FLOWSHEET STUDY on the flotation of molybdenite from copper has been issued by the Denver Equipment Company. The flowsheet study illustrates the molybdenite section of a copper mill and details the steps to produce a high-grade concentrate in excess of 90 percent MoS_2. Circle No. 48.

BELT CONVEYORS: The "Redi-Fab" belt conveyor line are described in a new 20-page, 2-color catalog just released by Barber-Greene Company. Now expanded to lengths ranging from 18 to 240 feet and capable of capacities up to 480 tph, the "Redi-Fab" line is fully standardized. Circle No. 49.

IMPACT BREAKERS are the subject of a new 8-page, 2-color brochure, Bulletin No. 60-A, recently issued by Kennedy Van Saun. Heavy-duty, dual-rotor impact breakers built to handle non-abrasive quarry rock at low cost are described. Circle No. 50.

NEW TRAXCAVATOR equipped with power shift transmission has been announced by the Caterpillar Tractor Company. Testing has shown the new track-type 977 Series H to have as much as 25 percent greater productivity than previous models. Circle No. 51.

WORM GEAR DRIVES are the subject of Engineering Catalog HGB just released by Foote Brothers. The illustrated booklet features sumplified selection procedures and rating tables so that the user can select the right drive for a specific refinement. Circle No. 53.

CLAMSHELL and dragline buckets are described in a new 32-page illustrated catalog just published by the Williams Bucket Division of Wellman Engineering. Principles of operation and selection as well as specification charts are included. Circle No. 54.

BRIDLE HITCH CLAMP provides a quick way of attaching a load to a bridle cable according to Sauerman Bros. This new wedge-type clamp holds the load securely in the bridle. Circle No. 55.

WORK GLOVES made of black, liquid-proof, DuPont neoprene, with a soft, flannel inner-lining that give more than three times the wear of ordinary coated gloves on many jobs have been introduced by The Pioneer Rubber Company. Circle No. 34.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY MAIL

FIRST CLASS PERMIT No. 1458, San Francisco, Calif.

MINING WORLD—WORLD MINING

500 HOWARD STREET

SAN FRANCISCO 5,

CALIFORNIA

U. S. A.

List information you want MINING WORLD to obtain for you on this card. WE'LL DO THE REST. NO postage necessary if mailed in U. S.

ONLY LOADER WITH SINGLE-LEVER SHIFT

You shift from any one gear to any other—forward or reverse . . . on-the-go. Allis-Chalmers tractor loaders make fast work far easier for any operator.

It's simple for a tractor loader operator to work faster—get more done. It's just as easy for him to go into a high gear as into a low gear—forward or reverse. ONE LEVER controls both speed and direction. No fumbling around with two or more levers or a combination of levers and foot pedals.

Besides operating simplicity, a tractor loader has *firmly connected axles*—attached to frame with 2-inch diameter steel pins . . . no rolling and shifting under load. *Extra stability* lets operators get and deliver bigger loads with greater comfort. Add *extra reach* for fast, even dumping and you can see why production is higher with an Allis-Chalmers tractor loader. Let your dealer show you. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

The "Big Three" tractor loaders range in size from the TL-14 with 5,300-lb carry capacity to the TL-20 (shown) with 9,000-lb carry. Each has a family of buckets—18 bucket loader combinations in all.

move ahead with

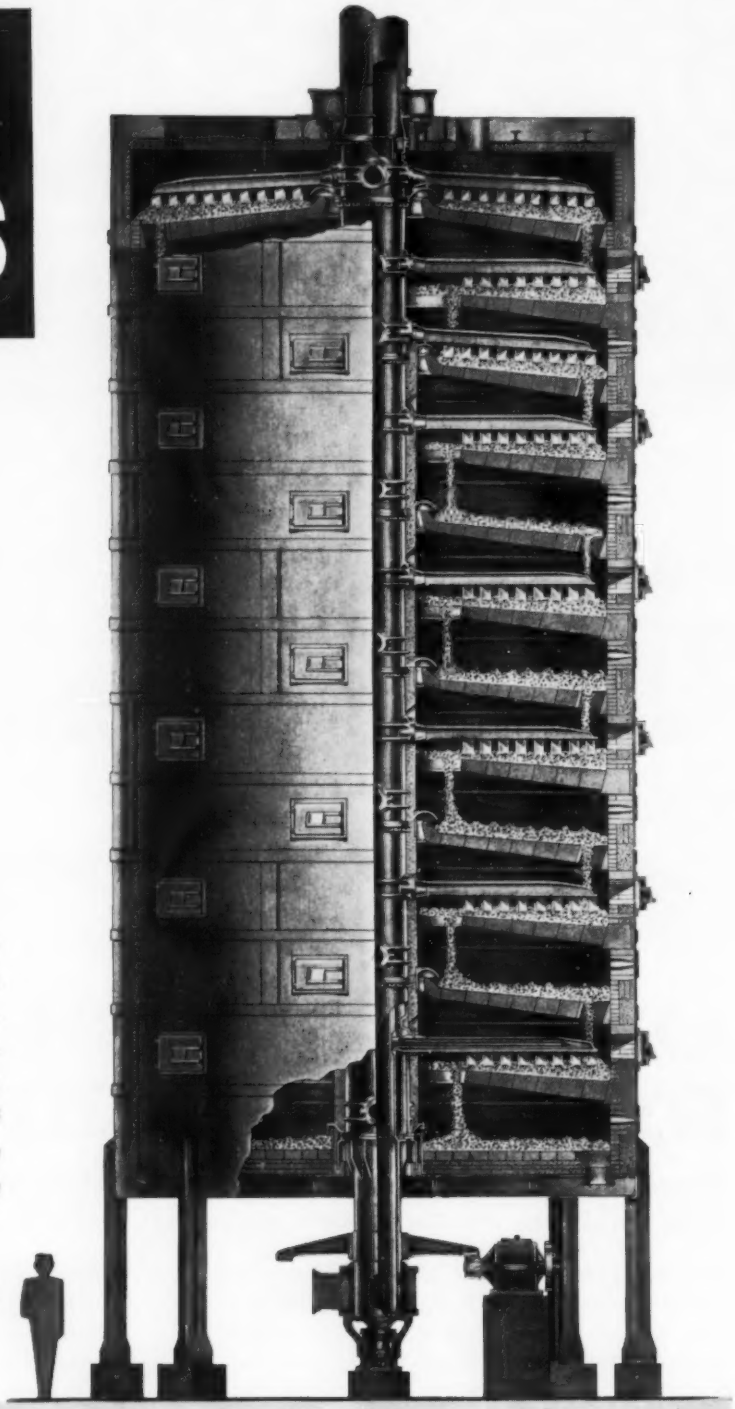
ALLIS-CHALMERS

. . . power for a growing world

PACIFIC FURNACES

for Roasting, Calcining, Drying, and Incinerating— Ores, Sludges, Chemicals, and Organic Materials.

- Multiple Hearth Furnaces
- Annular Furnaces
- Stack Kilns
- Dryers
- Retorts



Pacific, with more than a half century of know-how and experience in furnace design and construction, maintains complete laboratory facilities and equipment for making pilot runs, either batch or continuous. Thus you are assured of a furnace design, based on actual test operation, that will most efficiently meet your exact requirements.

You are invited to avail yourself of Pacific's consultation service. There is no obligation; for an immediate reply write to:

PFM PACIFIC FURNACE DIVISION

PACIFIC FOUNDRY AND METALLURGY CO.

NEW YORK • SAN FRANCISCO

3100 Nineteenth Street, San Francisco, California • 551 Fifth Avenue, New York City

MEN who make the news in the U. S. A.

R. J. LINNEY

F. SEATON and J. VANDERWILT

C. BRINCKERHOFF

C. J. PARKINSON

Robert J. Linney has been elected president and a director of Reserve Mining Company, Silver Bay, Minnesota. Mr. Linney, with his long experience in the processing of magnetite, and his managerial background, was selected to become the manager of operations of Reserve in 1950. During the four years construction of Reserve's project, Mr. Linney played an important role in the planning and selection of the complicated mining and processing equipment and machinery that would be employed. He has been executive vice president of Reserve since July 1958.

Robert L. Cranmer, formerly secretary of New Park Mining Company, Salt Lake City, Utah, has been elected vice president and assistant general manager of the firm. Mr. Cranmer's father, **W. H. Cranmer**, is president and general manager.

Paul S. Patchick has been appointed staff geologist in the Research and Development Department of Collier Carbon and Chemical Corporation. Previously a topographic engineer with the United States Army and a project mineralogist with the U. N. Korean Reconstruction Agency, Mr. Patchick has been a consulting geologist with industrial and chemical corporations for the past five years.

Dr. Ernest O. Kirkendall, Secretary of the AIME, has received an Alumni Award from Wayne State University, Detroit, Michigan, as "the discoverer of a phenomenon in diffusion of solid metals now known as the 'Kirkendall Effect' . . ." Dr. Kirkendall served on the Wayne faculty, first as an instructor, and then as assistant professor, prior to becoming an AIME executive in 1946.

Mining men receiving the 1960 Colorado School of Mines Distinguished Achievement Medals, (equivalent to the honorary doctorate), are: **Theodore F. Adams,** 1929 geological engineer, project manager of Blue River Construction Company, Denver, Colorado; **Max W. Bowen,** 1924 engineer of mines, executive vice president and general manager of Golden Cycle Corporation, Colorado Springs, Colorado; and **Vernon L. Mattson,** 1925 engineer of mines, manager of mines and milling, Kerr-McGee Oil Industries, Inc., Oklahoma City, Okla.

Albert M. Garbade, a director and former vice president, has been elected president of the United States Manganese Corporation. In this position, he succeeds **Frank B. Jewett, Jr.**, who resigned.

Secretary of the Interior **Fred A. Seaton** (left) was awarded an honorary doctor of engineering degree during the 86th Annual Commencement ceremonies of the Colorado School of Mines. He received his diploma from **Dr. John W. Vanderwilt** (right), president of the mineral engineering college. Mr. Seaton also delivered the main Commencement address.

Louis N. Schemmel, mining engineer with Pickands Mather & Company on the Mesabi iron range, has been transferred from the Erie Mining Company taconite operation at Hoyt Lakes, to Hibbing, Minnesota to start up the industrial engineering department for the firm's open pit iron mines.

Francis Mayhew, formerly chemist at the Susquehanna iron mine, Hibbing, Minnesota, for the Republic Steel Corporation, has moved to Crystal Falls, Michigan, where he has succeeded the late **Thomas Bowman** as chemist of the firm's Tobin iron mine.

R. D. Van Zante has been transferred from the Colorado Plateau Operations office of the Union Carbide Nuclear Company to the position of Field Engineer for the company's New York Engineering Department. Mr. Van Zante, who since coming to Union Carbide in 1949 has served as superintendent of the Rifle, Colorado plant and the Uravan, Colorado plant and as managerial assistant in Grand Junction, will confine his work to the Western States in the immediate future.

Kenneth M. Haley was recently promoted to assistant manager of the Silver Bay, Minnesota Division of Reserve Mining Company. **Donald E. Cooksey** was advanced to superintendent of the pelletizing department.

Ted Edwards, veteran underground mining expert, has been assigned as manager of the Mining Equipment Division for the New York District of the Eimco Corporation. In his new position, he will assist firms engaged in mining both as a consultant and sales specialist.

Jachin M. Forbes has been appointed manager of minerals development for the Beryllium Corporation of Reading, Pennsylvania. Mr. Forbes, formerly assistant vice president of William H. Muller & Co., Inc., an ore importing firm, will guide the corporation's raw materials program and expand activities aimed at increasing long-range supplies of beryllium ore.

Charles M. Brinckerhoff, president of the Anaconda Company, has been elected a director of ACF Industries, Incorporated, manufacturers of mining and other types of machinery. Mr. Brinckerhoff is a graduate of the Columbia University School of Mining, earning a degree in metallurgical engineering. His career with Anaconda began in 1935 when he joined the Andes Copper Mining Company, a subsidiary, as assistant mine superintendent after nine years with the Inspiration Consolidated Copper Company.

C. Jay Parkinson, vice president and general counsel of the Anaconda Company has been elected to the post of executive vice president and general counsel. Mr. Parkinson is a director of the Anaconda Company and many of its subsidiaries.

Quincy A. Shaw, Jr. has been named president of Bonneville, Ltd., Wendover, Utah, to succeed **Lockwood W. Ferris** of Salt Lake City, who resigned. A mining engineer, Mr. Shaw is a vice president and director of Mesabi Iron Company, and of North American Mines, Inc., a major stockholder in Bonneville.

James E. Schelske has been named superintendent of the Bennett Mine of Pickands Mather and Company at Keewatin, Minnesota, to succeed **Edwin R. Tyler,** who was appointed superintendent of the Hilton Operations in Quebec, Canada. **George Lerick** is Mr. Schelske's assistant.

Morris V. Mielke has been appointed assistant to the vice president—operations—for the Oliver Iron Mining Division, United States Steel Corporation. He has served as assistant general superintendent of the Eastern District prior to this appointment. Mr. Mielke joined Oliver in Duluth, Minnesota in 1948.

C. Harry Burgess has been elected vice president, exploration, of Kennecott Copper Corporation. Mr. Burgess has been president of Bear Creek Mining Company, Kennecott's domestic exploration subsidiary, for the past four years. He joined the Kennecott organization in 1952 as a geologist.

K. E. Merklin, metallurgist for Pickands Mather & Co. at Hibbing, Minnesota, was temporarily in Laborador in connection with the new pilot mill of Wabush Iron Company Ltd. The plant, which went into operation in March, is being tested for the production of iron concentrate.

"ON OUR GRANTS, NEW MEXICO WORK FLYGT PUMPS ARE THE ONLY PUMPS WHICH CAN DO THE JOB,"

reports

BOYLES BROS. DRILLING CO.

Salt Lake City, Utah

Well-known as mining contractors, engineers and geologists, Boyles Bros. Drilling Co. are sinking a variety of shafts in the famous Ambrosia Lake uranium district near Grants, New Mexico. The roster of Boyles Bros.' customers includes leading names in the mining and petroleum industry — firms which demand efficient equipment to obtain top performance. When it comes to dewatering, Boyles Bros. depend on Flygt Electric, Submersible Pumps.

Boyles Bros.' Mr. Victor L. Stevens, in his own words, puts it this way: "We have on our shaft jobs in Grants, New Mexico, 3 Flygt B-150s and 9 Flygt B-80Ls, and these pumps are solving the big problem in the Grants area, which is abrasive sand particles wherever water is encountered.

"We are using the Flygt B-150s and B-80Ls to handle a good part of our water, and they are very successful pumps. We feel that Flygt pumps are the only pumps that we know can do our job.

"We are concreting as we sink some of the shafts. When we hit water a lot of the cement washes out of the concrete lining and it is handled by the Flygt pumps. Where we were cement grouting off the water, a large amount of the cement went into the shaft and was pumped out by the Flygt Pumps," Mr. Stevens concludes.

Additional satisfied users of Flygt Pumps in mining applications include Climax Molybdenum Mines in Colorado, Inspiration Copper Mine in Arizona, Kermac Nuclear Fuels in New Mexico, Lucky Friday Silver-Lead Mines in Idaho, Utah Construction Co. in San Francisco, San Manuel Copper Mine in Arizona, White Cap Gold Mining Co. in Nevada, and others.

Flygt Electric, Submersible Pumps range from 1½" 85 gpm to 8" 3100 gpm capacity. Heads to 220'. Higher heads are possible with Flygt Pumps in tandem. Ask today for literature and an on-the-job demonstration.

CHECK THESE FLYGT FEATURES

- Electric
- Resistant to Salt Water
- Submersible
- Easy to Handle
- Low Maintenance Costs
- Will Pump High Amount of Solids
- Heavy Duty
- Operates Unattended
- Runs Dry Without Damage
- Quick and Easy to Service
- No Installation Costs
- No Priming Needed

WRITE FOR NAME OF YOUR NEAREST DEALER

PUMP BETTER ELECTRICALLY

FLYGT

— USE FLYGT!

WESTERN SALES & SERVICE

Stancs MFGS. & SALES INC.

1666 Ninth St. (Corner of Olympic & Ninth)
Santa Monica, California

AMERICAN ZINC LEAD AND SMELTING COMPANY

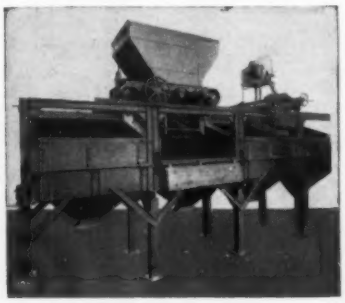
Buyers of zinc concentrates suitable for smelting in retort and electrolytic smelting plants. Also buyers of high-grade lead concentrates.

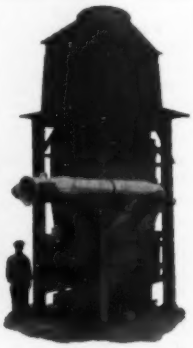
Address communications to
Ore Buying Department

Paul Brown Building
ST. LOUIS, MISSOURI

927 Old National Bank Building
SPOKANE, WASH.

P. O. Box 577
DUMAS, TEXAS





Smelting on the Site

- **Furnaces**
- **Sintering Hearths**

Saves high transportation and treatment charges on your ores and concentrates.

WRITE TODAY for literature on Mace Furnaces and Sintering Hearths

The Mace Company

FIRE CONCENTRATION METALLURGISTS

2763 Blake Street, Denver 5, Colo., U.S.A.

WHAT'S GOING ON in mining

Sulphur Mine Developed In Lake County, California

In Lake County, California, the American Mineral Resources Development Company is developing a major source for the chemical and sulphuric acid industry in the western United States. Under development since January, 1959, the operating mine is known as the S Bar S. Sulphur tonnage, according to geological estimates, is upwards of 15,000,000 tons.

Several drill holes have been put down to determine depth of overburden and general trend of the enriched ore zone. Actual depth of the ore body has not yet been determined since one drill hole to a depth of 180 feet in marketable ore had to be abandoned.

Surface mining is continually expanding the enriched ore zone and the surface exposure of 30 to 80 percent sulphur presently embraces over two acres.

The company, headed by C. Parker Henry of Berkeley, is presently marketing a product to Sacramento Valley farms called S Bar S Soil Sulphur, sold through Goforth Brothers of Williams, California. The sulphur is trucked to Williams for crushing and screening.

The land area of the mine covers about 140 acres, located some 100 miles north of San Francisco.

Kennecott Employs Atomic Device to Reclaim Mill Water

A water-reclamation project controlled by an atomic device was put into operation this summer by Kennecott Copper Corporation, Hayden, Arizona. It is believed to be one of the first application of atomic nature to the copper industry.

According to Kennecott officials, the new system is a key part of its expansion program to increase the capacity of the Ray Mines Division from 15,000 tons of ore per day to 22,500 tons. To achieve this expanded production, an additional water supply of 3,000 gallons per minute was needed. Since the company is limited by law to the use of 10,000 gallons of water per minute from the Gila River, the additional supply must come from reclaimed mill water.

Therefore, a 325-foot settling pool was built, into which water from the tailings is pumped. Solid particles suspended in the water drop to the bottom and are pushed to the center by large rakes. The clear water rises to the top of the pool where is is reclaimed for use.

The solids are flushed out the center through a pipe. At the entrance to this pipe is a box containing radioactive isotopes. On the other side of the pipe is a detection unit to measure the gamma rays given off by the isotopes. The density of the solids passing through the pipe is indicated by the intensity of gamma rays reaching the detector. When the density drops below a pre-set level, the detection unit automatically slows the flow, allowing more time for the solid particles to settle.

New milling equipment has been installed at the **Seventy-Nine** mine in the Banner district of Gila County, Arizona. The plant is designed to treat 20 tons per hour, or 160 tons per day, the ore to come from an open pit. Equipment in the pit includes a Gardner-Denver 1-yard tracks-cavator, two 5-yard trucks, Ingersoll-Rand drills and compressor. The principal metal values are in lead, with minor amounts of gold, silver, copper and zinc. The property is operated under lease agreement by Charles E. Goetz of Phoenix. N. C. Grissom, Hayden, is superintendent.

McFarland and Hullinger of Tucson, Arizona, have leased the old **Three R** mine in the Palmetto district of Santa Cruz County and started an active exploration program by means of diamond drilling. At present, drilling is from the lower adit, about 1,800 feet from the portal, and the third hole is being drilled. George C. Davis is in charge of the exploration work at the mine. The Three R, owned by Duane Bird and C. A. Pierce of Nogales, Arizona, has a production record of more than 10,000,000 pounds of copper, but has been idle for a number of years.

The Vivienne group of two unpatented claims in the Pima Mining District, south of Tucson, has been taken over on lease and option by Don Baines of Tucson. He is repairing and retimbering the old shaft, employing a crew of seven men. This vertical shaft, now 50 feet deep and in good condition, will be equipped with a permanent headframe and hoist, then sunk to a depth of 115 feet. Drifting to the vein will follow. Ore values are in lead, zinc, and silver, with a small amount of gold.

The Lavender Pit concentrator of **Phelps Dodge Corporation,** Bisbee, Arizona, was shut down for ten days in mid-June while major repairs were made on the primary crusher. The crusher's spider was broken when a large boulder was dumped into the hopper. During the concentrator's shutdown, pit operations were continued but limited to mining and hauling waste and leach material.

Approval has been given by stockholders of both companies for the acquisition of **Miami Copper Company's** operating mines and plants in Arizona by the **Tennessee Corporation,** and for the liquidation of Miami Copper. The sale is subject to a royalty interest in Miami copper ore reserves, being sold by Miami to institutional investors for $15,000,000 in cash. The plans includes issuance of 151,157 common shares of Tennessee Corporation to Miami and payment of about $3,253,000. Tennessee also is obligated to pay the institutional investors the royalties due. The Tennessee Corporation will operate Miami Copper Company's mines and plants in the Globe-Miami district of Arizona, and will acquire the physical and current assets of Miami's wholly owned **Chester Cable Company** in New York.

Drilling by **Industrial Uranium Company** in the Monument Valley district of Arizona has disclosed 50,000 tons of reserves on property to be known as the

CF&I Leases Arizona Land

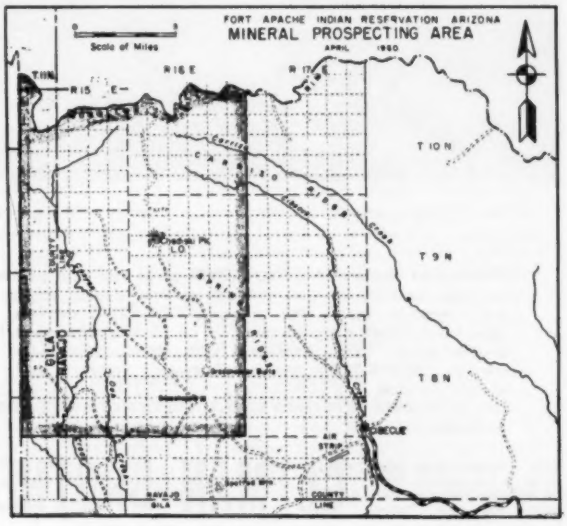
Colorado Fuel & Iron Corporation will explore iron-rich tribal lands of the Fort Apache Indian Reservation in Arizona, an area which the firm has been investigating for the last two years. Only bidder for the 120,000 acres of land in Navajo and Gila counties, the Colorado firm offered a bonus of $42,000 to the White Mountain Apache Tribal Council.

The permit gives rights to propect for iron ore and other minerals, except oil and gas, and calls for royalty rates of at least 15 cents a long ton of concentrate, or 20 cents a long ton of crude ore. The agreement also calls for the lessee to employ Indian labor, giving priority to tribe members in all positions for which they are qualified and available.

Land covered in the bid is the northwest part of the reservation embraced in T. 11 N., R. 15 E.; T. 8, T. 9, and T. 10 N., R. 15½ E.; and T. 8, T. 9, and T. 10 N., R. 16 E., Gila and Salt River Meridian.

Headquarters for the operation are to be at Cibecue, and a beneficiation plant might be built in Gila County.

An invitation for bids on land in the Papagao Reservation, Sells, Arizona, scheduled for opening June 20, have been withdrawn for the present. The area involved is in Sections 24 and 25, T. 8 S., R. 5 E., on the Papagao Reservation.



East Starlight mine. A 450-foot incline shaft is being sunk and mining of the ore body is to start in three months. Production is currently about 6,000 tons of ore monthly from the company's **Starlight, Water Chief** and **Sunlight** mines. The East Starlight will replace production from the Starlight mine which will be mined out in the near future. Robert M. Schubach is president of the firm, headquartered in Salt Lake City, Utah.

Fenninger Associates of Glendale, California, are studying the advisability of reopening the **South Vulture** mine in Maricopa County, 16 miles southwest of Wickenburg, Arizona. According to geological and mining reports, the area around the mine is as good or better than the old **Vulture mine**, according to Anthony Fenniger of the firm. The South Vulture was operated for some time up to 1936 and then shut down. All old equipment and buildings have been removed and the new operation will have completely new equipment.

Start of operations at the 750-ton manganese upgrading mill of **Century Mining Company** at Bouse, Arizona was scheduled for the end of July. Much of the equipment for the operation was purchased from the **Mohave Mining and Milling Company** of Wickenburg, Arizona, which is being liquidated. Century has contracts with **Kaiser Steel Corporation** in Fontana, California, for its output. The company estimates there is sufficient ore in present holdings for about seven years' operation.

Western Gold and Uranium, Inc., operator of the **Orphan** uranium mine at Grand Canyon, Arizona, reports that the new main shaft now services all sections of the mine, except the adit level and the area immediately below. This section is still serviced by the aerial tram. The company is beginning to realize the benefits resulting from its recent $1,200,000 development program and has been able to increase the rate of ore shipments materially, with April shipments estimated at 6,500 tons of ore compared to 4,000 tons monthly at the end of 1959. The development program, completed last October, transformed the Orphan from a 1,000-ton-per-month aerial tramway operation to a complete shaft-and-tunnel facility with a capacity of 8,000 tons per month. Current production is coming principally from the 245 and 310-foot levels. Maurice Castagne, Grand Canyon, is mine superintendent; Bob Hartman, assistant superintendent. Total payroll averages 90 men, with 75 of this number employed underground.

In the expansion program of **Ray Mines Division** of **Kennecott Copper Corporation**, moving of the secondary and tertiary crushing operations from Ray to Hayden was completed early in April. The movement of the primary crushed ore product in the new 100-ton ore cars began shortly after, when ore from two 38-car trains was dumped into the Hayden track hopper. Four grinding sections are now drawing ore from the new fine ore storage bin and conversion of the No. 2 grinding section is being completed. The No. 1 section, now drawing remaining ore from the old ore bins, will be changed to the new ore bin feeding system when the No. 2 conversion is finished. The new lime slaking plant near the smelter was slated for completion early in June. Later this year, a lime burning plant will be built to process lime-rock from the quarry for use in the concentrator. The company plans to purchase 500 tons of sponge iron monthly to increase the concentrator recovery.

Tungsten deposits in Yuma, Maricopa, Pina and Graham counties in Arizona are described in a publication written by V. B. Dale, United States Bureau of Mines' engineer at Tucson. The illustrated report covers many claims, groups, mines, prospects, mills, a refinery and properties in the four counties, and includes production figures, where available, for each deposit and for each county, along with estimated reserves by counties.

New labor contracts running to June 30, 1961, have been concluded by **Inspiration Consolidated Copper Company**, Inspiration, Arizona, and the various unions representing its employes. The new contracts provide for wage increases of from 8.5 cents to 11.5 cents per hour retroactively effective to July 1, 1959, the date of the expiration for the previous contracts, plus increases in miscellaneous employe benefits. Similar increments become effective on July 1, 1960. Inspiration employes did not go on strike last summer, having agreed to settle on the pattern adopted by other companies. The retroactive pay for the nine months of negotiations was estimated at $175,000.

Eight mining claims seven miles southwest of Alamo Crossing near Congress Junction, Arizona, have been purchased by James Tearney of Tucson from Mrs. Venice McGuffie. The claims contain gold, silver and copper, as well as silica which the new owner intends to mine. Ore will be shipped by truck to Wenden and then shipped by rail to the **American Smelting and Refining Company** smelter at Hayden, Arizona. When in full operation, about 35 persons are expected to be employed.

A small lead mill in the Alamo Crossing area of Arizona has been opened by Glen J. Froek of Wickenburg. Three truck loads of concentrate are being shipped weekly.

Wherever Ore Moves, **SCOOT-CRETE**

Ore Carriers Move It • FASTER • EASIER • AT LOWER COST

SCOOT-CRETE CD-4, shown being loaded in mine, will carry up to 15 tons payload. Model CD-3N has 5-ton payload. Note driver's side-mounted position for maximum vision and efficiency, forward and rear.

***Throughout the world,* SCOOT-CRETE gives top-rate performance. No rails needed, no ties, no cars, no independent power source. Diesel-powered for operation inside the mine, SCOOT-CRETE carriers are rugged for around-the-clock service; carry up to 15 tons at speeds to 15 mph, climb grades up to 18%. Available with standard or fully automatic transmission. SCOOT-CRETE has equal speeds forward and reverse for fast shuttle service.**

ALL CD MODELS APPROVED BY U.S. BUREAU OF MINES FOR UNDERGROUND MINING.

Units available from 3,000 lb. to 15-ton capacity. Write for specifications and literature. See your Dealer.

GETMAN BROTHERS SOUTH HAVEN, ZONE 5, MICHIGAN

CALIFORNIA

Settlement of a dispute on iron ore mining claims near Eagle Mountain, California, has been announced by **Columbia-Geneva Division** of **United States Steel Corporation** and **Kaiser Steel Corporation**. The firms have agreed to joint ownership of the claims, located about two miles east of Kaiser's **Eagle Pass** iron ore mine. Future development of the area may be undertaken either jointly or independently by the two companies under a royalty formula with the non-participating company. There are no plans for immediate development, however.

The placer mining venture of **Peerless Oil and Gas Company** and **Midwest Oil Corporation** of Denver, Colorado, in Death Valley National Monument, California, is being abandoned. The two firms had options on 96 claims covering almost 15,000 acres. During last year's so-called gold rush, discovery pits were dug in the Amarbosa River valley gravels. No minerals of value were found so the two firms are backfilling their discovery pits and endeavoring to restore the area to its original condition.

NEVADA

Bear Creek Mining Company reportedly has filed on about 100 miling claims in Mason Valley, near Yerington, Nevada, on which a drilling program may be initiated soon. The Yerington city council has granted the request by **Kennecott Copper Corporation** to release for mining some land in an area which the city had planned to use for municipal purposes. Bear Creek is Kennecott's exploration subsidiary.

An agreement between **Utah Construction and Mining Company** and **U. S. Lime Products Corporation,** a subsidiary of the **Flintkote Company,** may lead to establishment of limestone producing facilities at Pilot, Nevada. Utah Construction controls a limestone deposit at Pilot, which was formerly part of the operations of Ralph W. Duvall of Salt Lake City, Utah. Reportedly, if test shipments from the deposit prove satisfactory as to grade and other features, a quarry of some kind that would include crushing and shipping facilities might be established at Pilot. U. S. Lime Products in 1958 completed a $2,000,000 quicklime plant at Arrolime, Nevada, which processes limestone from nearby open-pit deposits.

Getchell Mine, Inc., at Golconda, Nevada, completed 2,168 feet of exploration and development during the last year. An early resumption of mining and milling is planned by the company as a result of anticipated further additions to oxide tonnages this year. The company will employ the open-pit, strip mining method and will require no new equipment to process the ore. Having completed the sinking of a three-compartment shaft to the 800-foot level in the North Shaft, Getchell Mines is driving a 600-foot cross-cut through the Getchell lode west to the footwall of the vein to explore promising drill-hole results. Additional tonnage of high grade gold ore is expected. Research on processes to beneficiate the ores, including the Fluo-Solids reactor and other milling facilities in the new flow sheet will continue. A geochemical survey program to better determine the potential of the mineralized area in the Getchell lode, extending about eight miles from the north boundary to the southern limits of the company's property, is also planned.

Several new ore bearing structures have been found during exploration by **Consolidated Eureka Mining Company** during the last year, and are being followed with encouraging results. During the year the company, operating in the Eureka lead-gold-silver district increased production, mining 1,475 tons of ore which contained 1,318.8 ounces of gold, 13,474.6 ounces of silver, and 251,750 pounds of lead. Development work consisted of 580 feet of raising, 50 feet of winze work, as well at 820 feet of drifting and crosscutting.

NEW MEXICO

The multi-million dollar gypsum plant of **Kaiser Gypsum Company, Inc.,** being completed this summer at Rosario, New Mexico, had a designed capacity equivalent to 275,000 square feet of ½-in. wallboard per day. Located about 20 miles from Santa Fe, it supplies products primarily to New Mexico, Colorado and Texas.

The American Metal Climax Foundation Inc. has awarded the **New Mexico Institute of Mining and Technology** a $750 grant for development of its mining and metallurgical departments. The grant, fourth one in that many years, was made at the suggestion of the **Southwest Potash Corporation** of Carlsbad, New Mexico, a subsidiary of **American Metal Climax Corporation** of New York, New York.

Surface diamond drilling by **American Zinc, Lead and Smelting Company** on New Mexico zinc property has indicated presence of a good grade of zinc ore at the **Kearney** mine where underground development has been started. It is expected that production from these properties will start by the end of the third quarter for this year. American Zinc this year acquired a 50 percent interest in the property, operated by **Peru Mining Company,** in an agreement with **Hydrometals, Inc.,** Peru's parent company. American Zinc invested $800,000 in the property and agreed to spend $200,000 in exploration, drilling and development before this November 1.

Additional property acquired adjacent to the Questa, New Mexico land of **Molybdenum Corporation of America** brings the firm's total holdings to some 3,900 acres in an extensively mineralized area. Underground tunneling and diamond drilling from both underground and surface locations have extended the outer limits of mineralized ground explored to about one mile square and 800 feet deep. The deposit as a whole comprises a very large low-grade mineralized area, in addition to enriched areas of indicated substantial size. Considerable molydenum has been encountered in the tunnels, with about 500 feet penetrated, averaging approximately 0.50 percent molybdenum sulfide. Further exploration of promising areas continues.

The uranium mill of **Kermac Nuclear Fuels Corporation** near Grants, New Mexico operated at its contract capacity of 3,630 tons of ore daily during April. Kermac is 58.95 percent owned by **Kerr-McGee Oil Industries, Inc.**

The Mountaineer Carbon Company, a jointly owned subsidiary of Standard Oil Company of Ohio and Consolidation Coal Company, is happy with its STANDARD rotary cooler.

This 8′x 80′ STANDARD cooler contains a direct water spray that quenches calcined coke just previously heated to nearly 2500°F. The water spray is so controlled as to give an essentially dry end-product.

When you are considering rotary dryers, coolers or kilns, STANDARD engineers can save you time and expense. Write now for the helpful new 28-page Bulletin.

STANDARD STEEL CORPORATION

General Office & Plant: 5031 Boyle Avenue, Los Angeles 58, California

Eastern Division—Office & Plant: **CAMBRIDGE COMPANY** Lowell 31, Mass. | Midwest Division—Office & Plant: **LEADER IRON WORKS** Decatur 31, Ill.

ROTARY DRYERS • KILNS • COOLERS • ASPHALT PLANTS • CRYOGENICS

Foote Mineral Will Build Tennessee Manganese Plant

A $6,000,000 electrolytic manganese facility will be built by Foote Mineral Company on a 700-acre plant site acquired early this year near Johnsonville, Tennessee. First unit of the 20,000,000-pound-per year plant is scheduled to go on steam in late 1961 or early 1962.

Foote now operates two manganese plants at Knoxville, Tennessee where capacity was expanded by 30 percent last year. The new plant is being built in anticipation of increased use of electrolytic manganese both here and abroad. Initial employment at the Johnsonville operation will be about 150. The company also expects to locate other manufacturing facilities on the property.

Southeast Kansas Proposed Site for Uranium Plant

Southeast Kansas may be the site for a uranium enrichment plant if current discussions and pilot scale studies work out successfully. Involved in the proposed project are Spencer Chemical Company of Riverton, Kansas, and Thor-Westcliffe Development Inc., of Santa Fe, New Mexico. The development firm has a license to import seven gas centrifuges for use in a pilot study to determine commercial feasibility of a process for producing enriched uranium.

The plant, which could be a $10,000,000 to $15,000,000 facility, would be operated similarly to that at Oak Ridge, Tennessee. The product, UF-6, would be extracted from gaseous forms of uranium now manufactured in Illinois. Location would be within the complex of Spencer Chemical operations where uranium fuel elements for atomic reactors have been produced for two years.

Eagle-Picher Company in July began a five-day week for its operations in the Illinois-Wisconsin zinc district, because of reduced sales in the past quarter and consequent increased inventories of concentrate at the smelters. The company operates two mines and a mill north of Galena, Illinois; a mine and mill at Schullsburg; a mine at Hazel Green, and a mill at Lindon, Wisconsin. The company has been on a six-day week since the Korean war.

Increased mineral activity is taking place in the area near Bunker, Missouri, about 20 miles south of Viburnum, where **St. Joseph Lead Company** is engaged in a big development program. Nearly 700 acres in the Bee Fork area, seven miles from Bunker, have been purchased by mining companies, as well as about 240 acres in the nearby West Fork vicinity. Drilling is being done in the Midridge area and there has been considerable leasing on Logan Creek from Midridge close to Ellington. One 213-acre farm in the Bee Fork area was sold recently for $32,000, and another one of 160 acres in West Fork brought the same price. At least 100 holes have been drilled in the Midridge area and 100,000 acres are under lease for mining in the county. Because of a housing shortage, geologists and drillers are living in trailer homes or driving in daily from nearby towns. (See feature article in this issue, "Missouri Exploration Boom," for map that shows areas mentioned here).

First high-grade ore from the $40,000,000 **Pea Ridge** iron mine of **Meramec Mining Company** has been taken out, although full operation of the project is not scheduled until 1962. Bearing out predictions, the ore is high grade magnetite, testing about 63 percent. More than 100,000,000 tons are estimated to be in the area. The No. 1 shaft for transporting men and materials was at 1,840 feet when the sample ore was taken. The shaft from which ore will be hoisted was 1,180 feet deep. Both will be dug to about 3,000 feet.

Plateau Mining Company expects to open its heavy media ore processing plant at its new location in West Plains, Missouri soon. The plant was moved from Koshkonong, 17 miles to the southwest. According to Roy Pledger of the company, the mill hopes to process a carload of ore an hour provided by small mines in the vicinity. Another heavy media plant has been opened at Koshkonong by the **Schroeder Mining Company** and at Teresita by **Shook and Fletcher.**

Construction on industrial buildings for the big **St. Joseph Lead Company** lead-zinc project in Viburnum, Missouri was completed in mid-June by Plez Lewis & Son, Inc. of St. Clair, Missouri, also in charge of equipment installations. Population of the new town, located at the junctions of Washington, Crawford and Iron counties, is approaching 200, and is expected to reach 2,000. Several dozen new homes have already been completed in the residential area under development. Before the start of the St. Joseph development Viburnum was a village comprised of a general store, two dwellings and a church.

Prospecting for iron ore in Missouri by **American Zinc, Lead and Smelting Company** in a joint venture with **Granite City Steel Company** continues to be promising and it is hoped that diamond drilling by the end of the year will indicate sufficient tonnage so that development plans for one of the properties may be started. Several years will be required to complete shaft sinking, underground development and surface preparation for mining and beneficiating between 8,000 and 12,000 tons of ore per day.

Ten diamond drills are now being operated by **Joy Manufacturing Company**, principal diamond drill contractor in the East Tennessee zinc district. With nine of the drills on a two-shift basis,

Republic Mine Expands Production Facilities

This is an aerial view of the Republic open-pit mine, primary crusher, flotation mill, and mine office of Marquette Mining Company, Republic, Michigan, where a 900,000-ton expansion program is under way. Capacity of the plant in the center of the picture will be increased from its 700,000 tons of iron ore concentrate to 1,600,000 tons annually by addition of increased crushing, grinding, and flotation facilities in a wing to the right of the present building. A new pelletizing plant will also be constructed nearby to handle much of the increased production. Half of the product is expected to average 64% percent iron content and this will be processed into pellets in the new plant; the remainder, with 62 percent iron content, will continue to be pelletized in the Eagle Mills plant 20 miles away. Marquette Mining is owned by Cleveland-Cliffs Iron Company, Jones & Laughlin Steel Corporation, International Harvester Company, and Wheeling Steel Corporation. Arthur G. McKee Company will build the pelletizing facilities which will use the Allis-Chalmers grate-kiln process; M. W. Kellogg Company will enlarge the crushing and concentrating facilities.

the company is drilling almost 20,000 feet each month. Joy is under contract to **American Zinc, New Jersey Zinc** and **Tri-State Zinc** companies.

Aluminum Company of America started up the first of five potlines at its partially completed Warrick Works near Evansville, Indiana. Aluminum produced from the first of the new facility's potlines will amount to about 35,000 tons annually or 20 percent of the plant's eventual annual production capacity. The four other potlines are in various stages of completion. With start-up of the Warrick works, about 300 persons will be employed. Eventual employment will be 1,200. Construction on the plant began in 1956 but work was gradually slowed down and then suspended in June, 1959. Construction began again last November with more than 700 men a month employed readying the first potline and other facilities for start of production.

Tri-State Zinc Company has begun fill-in diamond drilling on its west New Market, Tennessee, zinc property. The principal ore mineral, sphalerite, occurs as fracture filling in Knox dolomite. Depth of the ore varies from 700 feet to almost 2,000 feet below the surface. (See MINING WORLD, July 1960 page 57, for map).

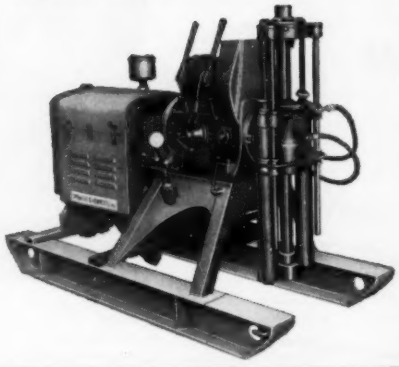
Tennessee Copper Company of Copperhill, Tennessee has contracted with **Cowan and Company** of Birmingham, Alabama for work in preparation to reopening the old **Silver Hill** lead, zinc, and silver mine at Lexington, North Carolina. The Tennessee Company, in exploring the old 772-foot shaft, has found indications of enough lead and zinc to justify operation of the mine, first mined for silver in 1838.

In the last year, **International Minerals and Chemical Corporation** has spent $1,200,000 for additional waste control equipment at its Bonnie Chemical plant in Florida. By late summer the plant will have a complete recirculating system for controlling both gas and liquid wastes from phosphate chemical processing. The efficiency of the equipment and system is such that more than 99 percent of the fluorine entering the plant with the phosphate rock will be accounted for in byproducts and other recoveries. New equipment includes a complex second-stage scrubber to supplement previously installed apparatus, and an additional scrubber where di-calcium phosphate is made. A non-effluent digestion scrubber will also be installed.

Winner of the **U. S. Bureau of Mines** national safety competition for 1959 in the non-metallic division was the **Clarence Center**, New York, mine of **Bestwall Gypsum Company**, where 265,192 man hours were worked without a lost-time injury. Fifty-one mines were in the non-metallic competition, which was won in 1958 by Bestwall's Grand Rapids, Michigan mine. Bestwall Gypsum, which last year began a multi-million dollar expansion program, also has a mine at Blue Rapids, Kansas, and quarries in Texas, Utah and Iowa.

A 622-acre trace of former phosphate land north of Lake Parker in Lakeland, Florida has been sold for use as a residential development.

"THIS IS THE BEST MACHINE FOR MOST CORE DRILLING JOBS"



IT'S AN S&H MODEL 40-CL

We've heard this phrase over and over again from our many customers. They know that it is unsurpassed for foundation investigation, mineral exploration, and grout hole drilling.

THIS IS WHY THEY BOUGHT A 40-CL

- **STABILITY** — Wider, longer skids and a sturdy steel frame make it very difficult to tip even when moving in mountainous terrain.
- **DEPENDABILITY** — The heavy-duty wire line hoist coupled with a rugged power unit offers more hoisting power than you'll ever need at the rated capacities.
- **ADAPTABILITY** — The choice of . . . power units, screwfeed or hydraulic swivelheads in varying spindle sizes, four transmission speeds and the availability of a side-mounted cathead and a built-in retracting mechanism makes the 40-CL adaptable to most drilling jobs.
- **MOBILITY** — The 40-CL has a built-in set of sheaves to facilitate movement under its own power. In addition a low-bed trailer is available that permits the use of the rig directly from the trailer mounting in locations where the terrain permits.
- **QUALITY** — Careful machining and time-tested inspection methods substantially increase the trouble-free drill life.

If you want a machine for truck mounting, ask about our 40-C TRUCK-MOUNT. When you want an "all-round" core drill machine, remember that the 40-C and 40-CL Core Drills are just the machines for you.

Look for our emblem... It's your Seal of Quality

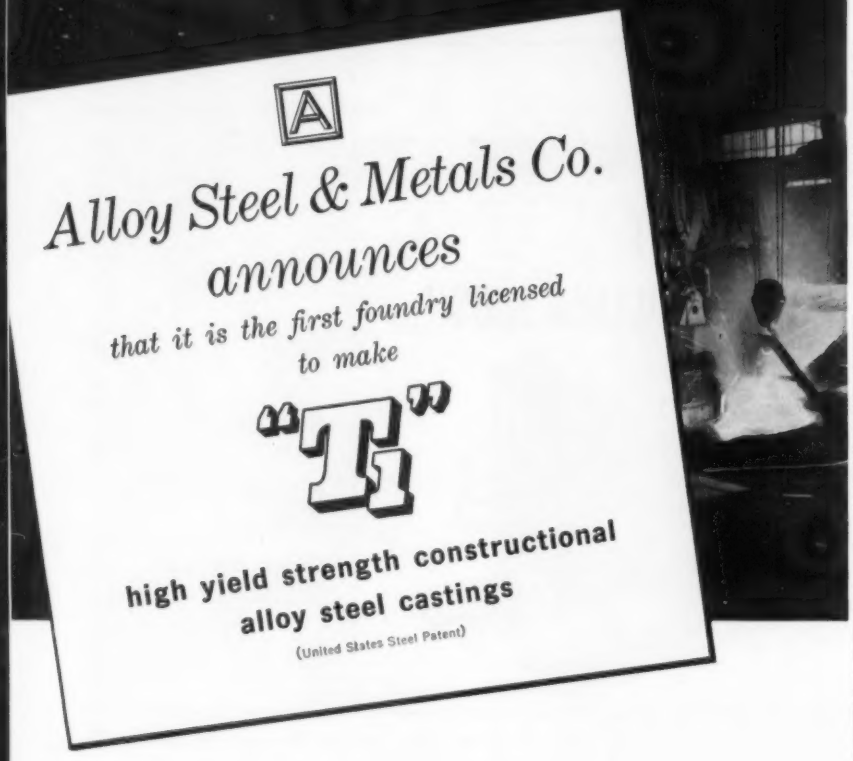
SPRAGUE & HENWOOD, Inc. S&H

SCRANTON 2, PA.

MEMBER OF: DIAMOND CORE DRILL MANUFACTURERS ASSOC.

New York—Philadelphia—Nashville—Pittsburgh—Grand Junction, Colo.—Buchans, Nfld.

Export Division: Sprague & Henwood International Corporation, 11 W. 42nd St., New York, N. Y.



Alloy Steel & Metals Co.
announces
that it is the first foundry licensed
to make
"T1"
high yield strength constructional
alloy steel castings
(United States Steel Patent)

GOOD NEWS for the Western Metal Industry. Now Alloy Steel & Metals Co. can supply you with castings made from "T-1" Steel. Plate and bar stock of this remarkable constructional alloy steel have been in use for several years. Now it is available for the first time for castings. Its casting characteristics allow designers to take advantage of the physical properties without "over-design".

Alloy Steel & Metals Co. was selected as the first foundry to be licensed because of its outstanding performance in producing castings for defense projects.

Outstanding Advantages of "T-1" Steel:

A proven engineering material.
Over 3 times the yield strength of structural carbon steel.
Weldable without preheating or postheating.
Exceptional toughness, even at subzero temperatures.
Outstanding resistance to the combination of impact abuse and abrasion.
Reduces ultimate costs.
Reduces weight safely—as much as 25% to 50%.
Outstanding for meeting ASTM Specifications A 148 and A 352.

For complete information on "T-1" constructional alloy steel castings, send for new Engineering Bulletin No. 300 A

"T-1" is a registered trademark of United States Steel.

ALLOY STEEL & METALS CO.
1848 E. 55TH ST. • LOS ANGELES 58, CALIF. • Phone LUdlow 3-3471
Mailing Address: BOX 58323 VERNON STATION, LOS ANGELES 58

IRON RANGES

Iron ore shipments from upper Lake Superior ports for the season, up to July 1, totalled 28,839,841, tons as compared with, 27,463,168 tons for the same period in 1959. Shipments from Canadian ports amounted to 1,360,742 tons, a decrease from last year's figure of 1,269,365.

In the continuing program of **Pickands Mather & Company** to improve the grade of its ore, a second screening plant is being built at the **Embarrass** mine at Biwabik, Minnesota, to prepare ore not now usable for beneficiating. Scheduled to start operation this summer, the plant will screen out oversize rock from stockpiled crude ore. Additional crushing and screening plants have also been built recently at the **Geneva** and **Newport** mines in Michigan to reduce the size of the ore shipped to ½ inch or less.

Oliver Iron Mining Division, United States Steel Corporation has consolidated its operations into one operating district according to an announcement by C. F. Beukema, president. Effective May 1, it combines the Eastern and Western districts into one operating area under the direction of John H. Hearding, Jr., general manager of Minnesota operations. John Chisholm, currently superintendent of Eastern district operations, will serve as assistant general manager. The consolidation is designed to improve efficiency and quality of Minnesota operations.

A new open-pit iron mine development at Eveleth, Minnesota, on the Mesabi range has been named **Nahma mine.** Operated by **North Range Mining Company,** it is an extension of the old **Leonidas** mine. A new stripping program for the new mine is under way.

Copper Range Company now owns about 270,000 acres of mineral rights in northern Michigan, equal to 422 square miles. This area includes about 100 square miles of land in which the Nonesuch Shale lies within practicable mining depth. The **White Pine** ore body occurs in the Nonesuch shale and continuous ore has been developed through an area of 10 square miles with limits not vet determined. Exploration indicates that there will probably be other large ore bodies in the formation. Drillings at the substantial copper-bearing ore body, discovered last year southwest of the White Pine property about 2,000 feet below the surface, confirms that the ore is the same type, but of higher copper content than that now mined at White Pine. Geologists estimate the content would be approximately 50,000,000 tons of ore with a copper content of 1.5 percent. If an adjoining area on Copper Range Company land previously drilled is included, the total content reaches 105,000,000 tons, averaging 1.3 percent. The company is studying a development program for facilities necessarv for annual mine production of 2,500,000 tons. Initial step in the development, which will cost an estimated $1,500,000, is construction of a development shaft to obtain additional data on detailed geology and characteristics of the ore.

Construction on Washington Silica Sand Plant Begins

Construction of a $500,000 high quality silica sand plant is now under way on a 25-acre site near Valley, Washington by the Lane Mountain Silica Company.

Northwestern Glass Company of Seattle, Washington, and Del Monte Properties Company of Pebble Beach, California own about 70 per cent of the stock of Lane Mountain, a Washington corporation, whose officers are Richard Osborne, president; Hugh H. Bein, vice president; Stanley P. Jones, secretary; and Murray Mathews, treasurer.

The processing plant will be a modern ore beneficiation works, utilizing crushing of pit-run material, milling, attritioning, flotation, filtering, and drying to produce an exceptionally high grade silica product.

A basic raw material widely used in industry, silica sand is the primary ingredient in glass making and is also important in the foundry, carborundum, and chemical industries.

The plant, which is expected to be in operation late this fall, will be under the management of the Del Monte Properties Company with Charles Smith of Valley, Washington, as superintendent and Hugh Bein in Charge of construction. William Hanot of Northwestern Glass is chief engineer.

Alaska Molybdenum Prospect Drilled at Hayes Glacier

Glacier Creek Mining Company has started diamond drilling on the molybdenum deposit discovered last year in the Hayes Glacier area, about 80 miles northwest of Anchorage, Alaska. Surveying, sampling and testing are being carried out on the property where exploration began as early as possible this year with helicopter lifts into the area even before all the snow had melted.

Field geological reports have been favorable and the property could well develop into a large low grade deposit.

Several large mining companies are said to be studying the area. Glacier Creek is reportedly under option to Newmont Mining Corporation.

American Chrome Achieves Underground Safety Record

The American Chrome Company of Nye, Montana, recently completed a full year of underground operations without a lost-time injury, a safety achievement for which two national awards have been given. The mine received the award of honor from the National Safety Council and the Certificate of Honor from the Joseph A. Holmes Safety Association. It is the only underground metal mine in the Northwest to receive the latter award.

During the record year, which ended May 28, a total of 213,000 tons of chromite was produced from four operating levels in the mine, resulting in 110,309 tons of chromite concentrate, most of which was sold to the government. At the present rate of production, the company expects to complete its present 900,000-ton government contract by the end of 1961.

American Chrome's pilot ferro-chrome reduction plant, built in 1958, produced 2,100 tons of metal of various grades, during the last year, mainly high carbon and medium carbon chrome. It is the only domestic producer of ferro-chrome alloys from domestic ore. The company plans to install a $225,000 refining furnace to test thoroughly the production of metals of lower carbon content.

American Chrome is a subsidiary of The Goldfield Consolidated Mines Company.

Little Squaw Mining Company has started drifting on a goldbearing quartz vein in its **Mikado** mine in the **Chandalar Lake** area. Earlier the mine crews had been timbering the portal, an ore chute, manway and raise. The 4,000-foot airfield which will be open year-around is scheduled to be finished soon, and the mine operators hope to have a road built by the state government from the airport to the mines. Eskil Anderson is vice president of Little Squaw, which is owned by **Grandview Mines** and **Metaline Mining and Leasing Company.**

The **Lost River Tin** mine on Seward Peninsula is again being offered for sale by the **General Services Administration,** which announces that bids will be received at its offices in Federal Office Building, Room 126, Seattle 4, Washington. The property consists of patented lode mining claims, purchase option on additional claims, mill and camp buildings, installed machinery and equipment and related personal property. All bids must be submitted on "Invitation, Bid and Acceptance" Form 10PRD-320. A complete study of the mine is given in the U. S. Bureau of Mines I. C. 7871 "Lode Mining at Lost River."

Carl Parker and a crew of four are operating the **Eva Creek** mine in Alaska under lease with the **United States Smelting, Refining and Mining Company.** Water to operate the sluices is lifted 120 feet over a distance of 3,400 feet, and nozzle pressure is 35 pounds. Some stripping is being done ahead of the present workings and there is little indication that previous mining operations worked the higher ground. Parker, who is vice president of the Alaska Miners Association, heads **Olive Creek Mines** and owns mining property in the Livengood country, where he intends to return when Eva Creek is mined out.

Aeromagnetic profiles for five Alaskan areas have been released on open file by the United States Geological Survey. The total intensity profiles cover parts of the Kobuk, Minchumina, Cape Espenberg, Cape Lisburne, and Brooks Range areas, giving data about changes in the earth's magnetic field along 62 traverses, totalling 4,500 miles. Copies with locational maps are available for inspection at Survey offices in Washington, D. C.; Juneau, College, and Anchorage, Alaska; Menlo Park, California; Denver, Colorado; Los Angeles and San Francisco, California; Spokane, Washington, and Dallas, Texas.

The merger of **Pine Creek Lead-Zinc Mining Company** into **Mascot Mines, Inc.,** has been approved by directors of the Shoshone County, Idaho firms. Each share of Pine Creek would be exchanged for one share of Mascot. Mascot owns 55 per cent of Pine Creek common stock and all of the preferred stock. It also is leasing the Pine Creek firm's **Little Pittsburgh** zinc-lead mine near Kellogg. Mining operations were suspended in 1953 because of low prices for base metals. Mascot recently participated in two small Arizona uranium mining ventures. M. C. Brown, Kellogg, Idaho, heads Mascot.

Rare Metals Corporation of Salt Lake City is making a radiometric survey of its thorite properties in northern Lemhi County, Idaho, in connection with a proposed mill. It took an operating contract last November covering holdings of **Agency Creek Thorium and Rare Metals Corporation.**

Coeur d'Alene Mines Corporation is seeking to interest large capital in further exploration at higher horizons of ore-bearing structures discovered at below sea level in the Silver Belt of the Coeur d'Alene mining region, Shoshone County, Idaho. **Hecla Mining Company** abandoned the deep-level work recently after producing some ore but failing to find consistent mineralization. The work had been carried on for several years from the 3,000-foot level of the **Silver Summit** mine under operating agreements with Coeur d'Alene Mines, **Rainbow Mining and Milling Company, American Silver Mining Company, Silver Standard Mining Company, Coeur d'Alene Consolidated Mining Company** and **Callahan Consolidated Mining Company.** The operating agreements have reverted to Coeur d'Alene Mines.

Several Idaho County mining properties have found purchasers at county tax auction. Gerald Haskins, Grangeville, paid $710 for the old **McKinley** gold mine one mile east of Lucile. Douglas E. Mullin, Grangeville, paid $1050 for 47 acres of patented ground a mile northeast of Elk City. Frank Wadley, Lucile, acquired a three-fourths interest in the **Katie B.** placer near Lucile for $150.

Index-Daley Mines Company has levied an assessment of 1 cent a share to raise about $24,000 to finance diamond drilling and other work in the Hailey area. Charles S. Woodward, Hailey, Idaho, is president.

Tungsten mill equipment of **Mullin Mines, Inc.,** Fall Creek, Idaho has been acquired by **Idaho Mining and Milling, Inc.** of Lewiston. A washing and trommel screen from the mill will be installed on the firm's No. 2 dredge this season in Idaho county's Florence Basin gold country.

Clayton Silver Mines is developing the new bottom 800-foot level of its mine near Clayton, Custer County, Idaho. The firm operated on break-even basis in the first five months of this

International Smelting and Refining Co.

ANACONDA
from mine to consumer

Buyers of

Lead & Zinc Ores
and Concentrates

Lead and Lead-Zinc Smelter
Lead-Zinc Concentrator
} Tooele, Utah

Address: Ore Purchasing Department

International Smelting and Refining Co.
815 Kearns Building
Salt Lake City, Utah
Please establish contact prior to shipment

INSPIRATION CONSOLIDATED COPPER COMPANY

formerly
International Smelting and Refining Co.
(Miami Plant)

Buyers of
Copper, Silver and Gold
Ore and Concentrates

Address: Smelting Department
Inspiration Consolidated Copper Co.
Inspiration, Arizona

PURCHASERS OF
LEAD AND ZINC
CONCENTRATES

THE
BUNKER HILL
COMPANY

Producers of Top Quality Products

LEAD • ZINC • CADMIUM • SILVER • LEAD AND LEAD ALLOY PRODUCTS • CHEMICAL PRODUCTS

WIRE
PHONE
WRITE
ORE PURCHASING DEPT. · THE BUNKER HILL COMPANY
Telephone: Kellogg 2261 · P. O. Box 29, Kellogg, Idaho

CONTRACT CORE DRILLING

EXPLORATION FOR MINERAL DEPOSITS
INCLUDING URANIUM & LIMESTONE — ANYWHERE

FOUNDATION TEST BORING

GROUT HOLE DRILLING

Skilled crews and complete stock of core drills and accessory equipment maintained at all times

Core Drill Contractors for more than 60 years

JOY MANUFACTURING CO.
Contract Core Drill Division
MICHIGAN CITY, INDIANA

Extra Copies
1960
MINING WORLD CATALOG SURVEY AND DIRECTORY
Available at $1.00 each
Send Your Order to 500 Howard St., San Francisco

year because of the low price for lead but paid a dividend of $60,000 or 2 cents a share by selling 1,500 tons of zinc concentrate stockpiled over the last several years. W. M. Yeaman, Yakima, Washington, is president.

Lucky Friday Silver-Lead Mines Company's new concentrator near Mullan, Shoshone County, Idaho treated nearly 50,000 tons of ore in the first five months of this year. The millheads averaged 8.7 percent lead and 16.9 ounces of silver per ton. The **Lucky Friday** mine and mill are controlled and operated by **Hecla Mining Company,** of Wallace, Idaho.

The **Bunker Hill Company,** Kellogg, Idaho, mining and smelting firm, completed its $2,000,000 phosphoric acid plant ahead of a July 1 target date and is planning to start production at the conclusion of a labor strike which shut down company operations May 5.

The old Bayhorse Mining District in central Custer County, Idaho is the site of a new exploration and development project by **Sidney Mining Company** of Kellogg. Work is being carried out under an agreement with **Umont Mining, Inc.,** which holds a lease and option from **Bayhorse Mines, Inc.,** covering virtually the entire district which yielded more than $15,000,000 worth of silver, lead, and copper ore between 1877 and 1925. Current drilling is in Beardsley Gulch to explore the K-7 fault zone, found parallel to the Beardsley fault zone which has produced high grade silver ore bodies in the Bayshore dolomite beneath the Ramshorn slate. Encouraging mineralization has been found. Sidney also is planning shaft deepening and drifting at the **Happy Day** gold property west of Haily, in Blaine County's Mineral Hill district. The **Sidney** zinc-lead mine in the Pine Creek district of Shoshone County has been virtually worked-out after yielding $32,000,000 worth of ore and Sidney's 1959 operating contract at the adjoining **Nabob** mine proved to be a losing venture. The operating agreement with **Nabob Mining Company** has been terminated and the company is shifting its interest from the base metals in the Coeur d'Alenes to silver, gold, and uranium in central Idaho. Sidney continues active in developing uranium showings in the Basin Creek district, Custer County, northeast of Stanley. Malcolm C. Brown, Kellogg, is president.

A faulted and lost section of the Minnie Moore vein has been found at the **Minnie Moore** mine near Bellevue, Blaine County, Idaho and drifting toward an anticipated ore shoot was under way at last report. The project was started last September and work included rehabilitation of 3200 feet of old mine workings. The mine is operated by **Silver Star Queens Mines, Inc.** Joe A. Foster is president, and Ralph Thurston, geologist.

Iron ore in the **Gold Hill** mining district near Princeton, northern Latah County, Idaho is being test-drilled by **Adams Winston Western Syndicate,** Duluth, Minnesota. First holes were put down about 100 feet. Steven Blanich is mining engineer in charge of the core drilling.

Idaho Mining and Milling, Inc., plans this season to erect a gold dredge purchased last year and transported to company placer claims in Idaho County's Florence Basin, scene of early-day gold production. Camp buildings were constructed last season. Clyde E. Jungert, Sunnyside, Washington, has purchased one-third of the personal stock holdings of Philip W. Jungert, Lewiston, company president, and Marion Jungert, secretary-treasurer. Proceeds were turned into the company as a gift.

MONTANA

The old **Bannack** gold mine in Beaverhead County, Montana, is being returned to production by **Spokane National Mines, Inc.,** Spokane, Washington. The rehabilitated Bannack cyanide mill has a capacity of 80 to 100 tons of ore a day. Flotation cells are being installed to test the amenability of complex silver ores from the firm's near-by **New Departure** silver mine. Since acquiring the properties last fall, the Spokane firm also has widened 175 feet of the Bannack adit to accommodate electric locomotives and large ore cars, installed new ties, rails, air and water lines, and moved mining equipment to the property from the **Sunset Mines** property near Kellogg, Idaho.

The **J. R. Simplot Company** of Pocatello, Idaho has acquired the entire fertilizer plant facilities of **The Anaconda Company** at Anaconda, Montana, and has leased that company's phosphate properties at Conda, Idaho, on a long-term basis. Anaconda will operate the phosphoric acid and ammonium phosphate facilities for Simplot, which will market the products.

The **Easton Pacific Riverside Mining Company** is now producing ore from the old **Easton Pacific** mine near Virginia City, Montana. A long cross cut, driven several years ago, intersected several veins. The work at the mine now consists of drifting and stoping on these veins.

The **Horse Creek Development Group** in Montana has constructed a road to an old abandoned cross cut which was driven by the old timers to intersect an outcropping of ore. Present plans call for lengthening this cross cut to the vein projection at the cross cut elevation.

Hughesville Lumber and Mining Company is a firm recently incorporated in Montana for $50,000. Headquarters are in Great Falls.

Nancy Lee Mines, Inc., recently made an initial shipment of concentrates from the new ore shoot found on the new bottom level of the Nancy Lee mine west of Superior, Montana. Ore milled was from development drifting. Concentrates were shipped to the East Helena smelter. Some mill circuit changes were being made to recover copper content of the silver-lead-zinc ore. Drifting operations on the ore from the new shaft level have been run for 96 feet and are still in good ore, averaging up to 12 feet in width. Drifts will be continued until the length of the oreshoot is established and then raises will be driven.

Just name your pump requirements!

John Bean handles the big jobs, the small jobs, the TOUGH jobs

John Bean High Pressure Reciprocating Pumps provide capacities from 0.5 gpm to 100 gpm and pressures from 100 psi to 12,000 psi.

LOOK FOR THESE LOW-MAINTENANCE FEATURES:

- ★ **Inside or outside packed.**
- ★ **Lifetime sapphite cylinders or plungers.**
- ★ **"Roto-Splash" lubrication to all drive end parts.**
- ★ **Distortion-free cast iron housings for constant bearing alignment.**
- ★ **Replaceable valve seats and free-acting, ball-type valves—easy maintenance.**

ALSO: packaged power pumping units, custom designed pumps, and high pressure washing units . . .

WRITE FOR FREE CATALOG

John BEAN fmc

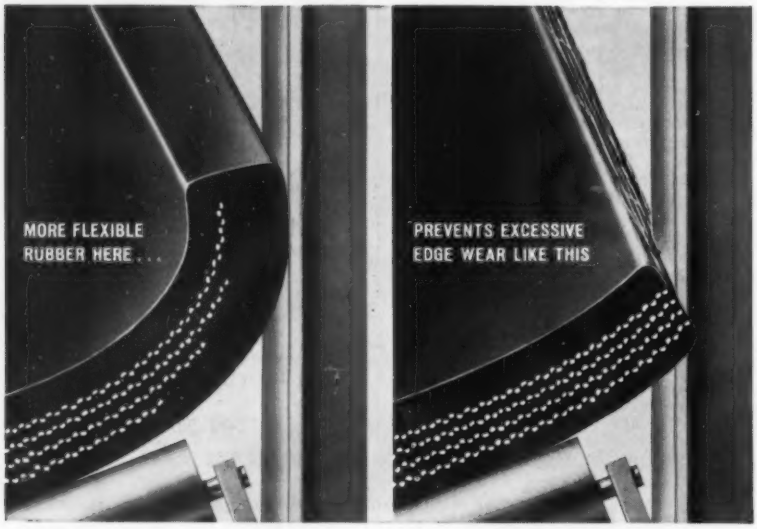
DIVISION OF
FOOD MACHINERY AND CHEMICAL CORP.
San Jose, Calif. • Lansing, Mich. • Orlando, Fla.

INDUSTRIAL PUMPS

Dept. MW-3
San Jose 1, Calif. Lansing 4, Mich.

Quaker Thermoid

"COLEDGE" BELTING REDUCES EDGE WEAR, ADDS MILES OF USE!



Improper training can ruin a conveyor belt faster than any other abuse. Riding up and rubbing against a frame member soon wears away the stiff edge of conventional belting and exposes the carcass plys to moisture, mildew, dirt and eventual ply separation. "Coledge" belt construction was developed by Thermoid Division—to overcome this weakness and extend belt life.

"Coledge" construction puts plenty of extra rubber on the edges where it counts . . . plys are stepped back to make a more flexible edge that rides with the punches when misalignment occurs. This "Coledge" construction is available in any standard type belt.

So, if you have an edge-wear problem with conveyor belts, specify "Coledge" construction. See your Thermoid Division distributor for technical data or assistance or write, *Thermoid Division, H. K. Porter Company, Inc., 200 Whitehead Road, Trenton 6, New Jersey.*

THERMOID PORTER DIVISION

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

WASHINGTON

Grandview Mines, Inc., is carrying on annual assesment work at its properties in northern Stevens County, Washington. Drilling of leased ground adjoining the **Anderson** open-pit mining property of **Goldfield Consolidated Mines, Inc.**, in the Leadpoint district continues to add to zinc-lead reserves. Eskil Anderson, of Spokane, Washington is company geologist and mining engineer in charge. Karl W. Jasper, Spokane, is president.

Quarrying and processing operations of **Northwest Magnesite Company** at Chewelah, Stevens County, Washington were suspended recently pending a pick-up in orders from the steel industry. All except 25 of the 200 employees were laid off. Howard Ziebell is plant manager.

An expanded diamond drilling program is scheduled this season at the **Anderson** open-pit zinc mine in Stevens County's Northport district, Washington and plans are being made to return the property to production. It was shut down in 1952 because of poor marketing conditions for zinc. Last summer, the owner, **Goldfield Consolidated Mines Company**, discovered unknown ore in diamond drilling. The management recently announced that the find constituted an important ore body amenable to open-pit mining. Goldfield, for years one of Washington's major producers of zinc and lead, halted production in Stevens County in 1956 when it closed its **Deep Creek** mine and Aladdin mill.

Dawn Mining Company has obtained an Atomic Energy Commission extension until December 31, 1966, of its contract to sell uranium concentrates produced at its Ford, Washington processing plant. The 400-ton mill has been operating at capacity. Most of the ore handled is mined by Dawn at the **Midnite** mine northwest of Ford in the Spokane Indian Reservation, Stevens County. The mill uses stockpiled ore in winter when weather conditions shut down open-pit mining.

A new ore body indicated by 20 downholes is being opened by bulldozer at the Mount Spokane district property of **Daybreak Uranium, Inc.** Radioactivity was at depths of 30 to 36 feet. Kae Sowers is company secretary-treasurer and Herbert Sam is the contractor.

Pend Oreille Mines and Metals Company has been operating at virtual capacity of its 2400-ton East Side mill the last few months but at last report the International Union of Mine, Mill and Smelter Workers had shut down the Bunker Hill smelter to which Pend Oreille concentrates are shipped. Storage facilities are sufficient for about two months.

The new 11th level south drift on the Gold Dollar ore body at Republic, Ferry County, Washington has disclosed gold-silver ore for about three-fourths of the anticipated stoping length. Grade is good but not as high as on the 10th level above. The mine is operated by **Knob Hill Mines, Inc.**, from its mine workings under lease from **Day Mines, Inc.**

Significant Beryllium Deposit Located in Utah Mountain

A beryllium ore deposit of significant size has been located in the Topaz Mountain area of western Utah, about 150 miles from Salt Lake City. Officials of Vitro Minerals Corporation, one of the largest claim holders in the area, said the ore is found in disseminated non-pegmatitic deposits, much of it lying close to the surface where it can be mined by open-pit methods.

Studies indicate the new ore is readily soluble in sulphuric acid and apparently amenable to conventional hydro-metallurgical processing. Vitro geologists report the ore contains a new beryllium mineral they propose to call "vitroite." Economics of processing the mineral are being studied by Vitro at its Salt Lake City uranium plant.

The race in recent weeks to stake beryllium claims in the area was touched off by alert prospectors who discovered outcrops of the new ore. The resulting activity by major mining companies was reminiscent of the early days of the uranium rush.

Three Salt Lake City prospectors recently reported another discovery of beryllium, this one on the east side of Baldy Mountain near Calio in Juab county. The prospectors—Paul, Daniel, and Samuel Mertin—have obtained a state lease of 160 acres in the area, which is about 60 miles due west of Spor Mountain in the Topaz region.

The outcrop contains beryl crystals assaying about 14 percent beryllium oxide and a quartzitic-appearing rock estimated to assay about 0.5 percent BeO. It covers an area about 300 by 150 feet. A sample has been sent to the U. S. Bureau of Mines station in South Dakota for further analysis.

Minerals Conference Slated At Salt Lake in October

The Newhouse Hotel in Salt Lake City, Utah, will be headquarters for the Sixth Annual Rocky Mountain Minerals Conference to be held October 5, 6 and 7. According to J. M. Ehrhorn, general chairman, the session will feature five technical sessions, including a symposium. Field trips, social events for women, and a dinner dance are among other events scheduled. Registration begins the afternoon of October 4.

U. S. Steel Awards Contracts For Wyoming Taconite Project

Prime contract for the multi-million dollar Atlantic City, Wyoming, taconite project of United States Steel Corporation has been awarded to Pomeroy-Bechtel Joint Venture, a firm that represents a joint undertaking of J. H. Pomeroy & Co. and Bechtel Corporation for creation of the open-pit taconite mine and beneficiation unit. Both are San Francisco firms. (See MINING WORLD, July 1960, page 27)

A sub-contract for construction of the 4,000-ton-a-day pelletizing plant at Atlantic City was awarded to Arthur G. McKee and Company of New York.

Work involved in the Pomeroy-Bechtel contract includes 7,500,000 cubic yards of excavation; pouring 33,000 cubic yards of concrete; placing 5,000 tons of machinery; damming and rerouting of Rock Creek around the project site; construction of a large reservoir and two earth-fill dams; building foundations for ore crushing, screening, and concentrating plants, and other structures; and building a 77-mile standard gauge railroad from the plant site to Winton Junction.

The taconite project, to cost an estimated $60,000,000, is part of the Columbia-Geneva Steel Division of United States Steel and will supply pelletized ore to that division's integrated steel plant at Geneva Works, Utah.

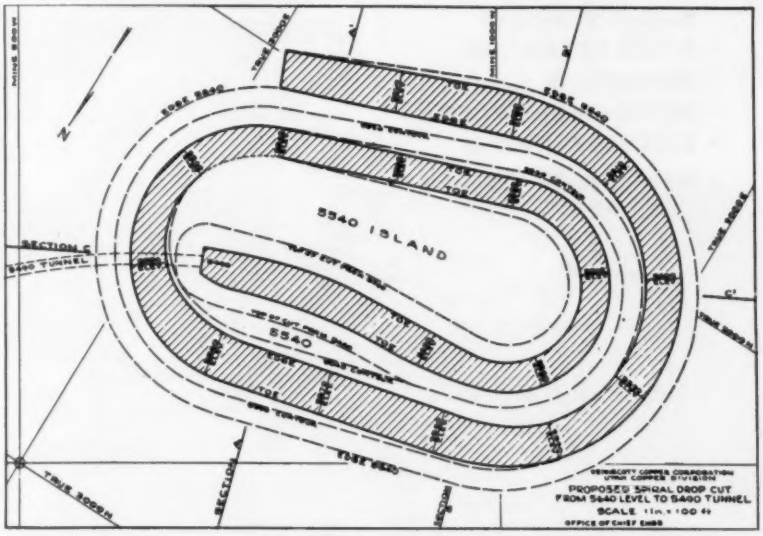
COLORADO

R. F. Magor III has started a gold strip mine at Crested Butte under the name of the **Silver Crest Mining Company**. Robert Davidson is superintendent.

Domestic ore reserves of uranium at the end of 1959 were estimated at 86,-100,000 tons, in addition to stockpiles totalling 1,449,069 dry tons. According to the **Atomic Energy Commission** at the start of this year there were 25 uranium processing mills operating in the western United States, including the **Cotter Corporation** pilot plant at Canon City, Colorado, being enlarged to a 200-ton-a-d mill. The only government-owned mi at Monticello, Utah, closed at the end of 1959. Uranium concentrates received during the last half of 1959 at the AEC depot at Grand Junction, Colorado totalled 7,899 tons, with an additional 90 tons produced as byproducts of phosphate rock and from treatment of Idaho euxenite.

GeoResources Exploration Inc. is a new Colorado corporation currently investigating uranium, placer gold deposits and vein-type beryl deposits throughout the country. President of the firm, recently registered with the Securities and Exchange Commission, is R. C. Vickers, a mining geologist formerly with the **United States Geological Survey.**

A possible closing down of its mining operation is under consideration by **Golden Cycle Corporation** which has produced gold in Colorado's Cripple Creek district for over 50 years. Although no date has been set for ceasing operations, Merrill Shoup, Golden Cycle president, said that unless some relief is received, either in the price paid for gold, or lower operating costs, the company faces the possibility of shutting down all gold mining operations, hoping for a return to normal conditions. The firm's Atkinson Mesa uranium development in Montrose County, Colorado, was about the only profitable operation during 1959, with a production of 20,443 tons of ore valued at $745,282. The Golden Cycle Carlton mill has been placed on a five-day week because tonnage produced in Cripple Creek has been so low.



Kennecott Plans Spiral Drop-Cut at Bingham

A giant excavation project begun by Kennecott Copper Corporation at its Bingham, Utah, mine means removal of 5,000,000 tons of ore from below the present pit bottom. It involves a spiral approach to the 5490 tunnel which is 150 feet below the present bottom of the pit, a method considered more feasible than the previous time-consuming method of establishing new levels 50 feet below each other. The spiral drop-cut, illustrated in the schematic diagram above, will ultimately have a railbed 3,600 feet long on a 4.0 percent grade. Excavation is being done by Morrison-Knudson Company which will haul ore to upper levels to be loaded for transport to Kennecott's Flotation Mills. The spiral is scheduled to be completed in nine months, when work will also be finished on drainage, trackage, and electrification of the new tunnel, which is 17,951 feet long. Most of the excavation will be done without blasting. Huge rippers will break the rock, then Carryalls will scoop it up.

When you need competent hands to deliver a core . . . to mine some ore . . . or a tunnel to bore . . . choose Boyles Bros.

65 years of dependable drilling for the mining and construction industries

- **CORE DRILLING**
- **EXPLORATION and DEVELOPMENT**
- **SHAFT SINKING**
- **ROCK BREAKING**
- **GROUTING**
- **MINING and QUARRYING**
- **TUNNEL DRIVING**
- **MINE PLANT DESIGN and FABRICATION**

Chicago Pneumatic

DIAMOND DRILLS AND EQUIPMENT

Write for full details

Boyles Bros. DRILLING COMPANY

GENERAL OFFICES:
Salt Lake City, Utah.....HUnter 7-7595
BRANCHES:
Phoenix, Arizona.....CRestwood 4-5331
Sacramento, California...IVanhoe 3-5221
Denver, Colorado.....ALpine 5-9244
St. Louis, Missouri.....PLateau 2-2544
Reno, Nevada.....FAirview 9-0732
Spokane, Washington....WAlnut 4-2614
Alaska.....Contact Salt Lake City Office

UTAH

Shattuck Denn Mining Corporation has purchased the uranium mining property owned by **MRB Mining and Exploration Company** near Green River, Utah. Since the mine was largely equipped and developed, the new owner expects to begin shipments soon. All known ore at Shattuck Denn's **Bardon** mine in San Juan County, Utah, has been extracted and shipments ceased in May. Production at the mine, acquired in 1958, closely approximated original estimates. Further exploration in that area is under consideration.

An iron ore beneficiation plant to be built by **Utah Construction and Mining Company** at its **Iron Springs** mine in Iron County, Utah, is scheduled to be in operation next spring. The beneficiation unit will consist of an addition to present crushing and screening facilities at the mine. Utah Construction has a long-term contract with the **Columbia-Geneva Steel Division** of **United States Steel Corporation** covering production and sale of ore from the Iron Springs mine. Since Utah Construction plans to mine some lower grade ore in the future, the new beneficiation unit will enable the firm to continue delivering ores of the grade value provided in the contract. The new unit will not treat any ores from properties of Colorado Fuel & Iron Company in the Comstock district, also operated by Utah Construction.

Development of a major open-pit copper mine continues to be the dream of the **New Park Mining Company,** shareholders were told at a recent meeting in Salt Lake City, Utah. W. H. H. Cranmer, president of the lead-silver-gold producer, said that from the beginning, with his discovery of the Mayflower mine in the 1920's, the future has been related to development of a pit the size of Utah Copper's Bingham mine, along with "extensive underground workings." Directors of New Park named Robert L. Cranmer as executive vice president and assistant general manager of the mining company. He succeeds Clark L. Wilson, who now is serving as chairman of the Emergency Lead Zinc Committee at Washington, D. C. New Park is engaged in a $750,000 exploration and development program for new ore at depths in the Park City properties.

Officials of **Standard Metals Corporation** of Moab, Utah, expect their firm to continue producing uranium after 1966 when the Atomic Energy Commission intends stopping present low volume purchases of uranium from domestic mills. High grade ore reserves and low operating costs will make it possible for the survival of Standard Metals after 1966 when the domestic market will probably be strong enough to support the remaining uranium business, according to Russell L. Wood, assistant general manager of the firm. Standard Metals, formerly Standard Uranium Corporation, is entering the base metals field, planning to concentrate on zinc for greatest earnings with other metals as byproducts. The company's holdings include property near Crested Butte and Silverton, Colo.

Hidden Splendor Mining Company is presently conducting its Big Indian district, Utah, mining operations through three shafts. One is on the Ike-Nixon properties, one on the Columbia group of claims through which the company mines the Mamie ore body for **Uranium Reduction Company,** and a third on the North Almar group of properties. Hidden Splendor may also mine Uranium Reduction's Cal-Uranium ore body at a later date. The South Almar properties are expected to be brought into production late this year or in early 1961 by extension from the North Almar shaft or by an independent shaft. Operations at the company's **Radium King** mine in the Red Canyon district of Utah are conducted through inclined adits.

WYOMING

Plans for a joint venture to build an 800 to 1,000-ton-per-day uranium mill in Wyoming's Shirley Basin area, (see MINING WORLD, May 1960, page 29) have been announced by **Hidden Splendor Mining Company, Federal Resources Corporation,** and **Gas Hills Uranium Company.** The venture will involve some 1,500 mining claims on which more than 300,000 feet of drilling has been completed to evaluate reserves, now placed at several million tons. Proposed production of the mill is 1,000,000 pounds of uranium concentrate annually. Federal and Gas Hills are now partners in a 522-ton-per-day mill in the Gas Hills, Wyoming district. Hidden Splendor also owns properties in that area. Negotiations for another mill in the Shirley Basin area, 60 miles south of Casper, are being made by **Tidewater Oil Company** and **Kerr McGee Oil Industries Inc.** The Atomic Energy Commission is currently determining reserves of firms in the Shirley Basin which are applicable to the 1966 domestic uranium concentrate program.

The **Wyoming Mining Association** during its annual convention at Jackson elected Roy Coulson of Riverton to succeed Myron L. Sisson of Sunrise as president. Serving with him are C. J. Paustian of Greybull, vice president; H. E. Potter of Laramie, secretary-treasurer, and R. W. Beamer of Riverton, executive secretary. Directors are V. O. Murray, Rock Springs; E. L. Stout, Green River; A. W. Runge, Riverton; A. V. Quine, Riverton; Harry Thorson, Newcastle, Glenn E. Sorenson, Kemmerer; Veryl Hoover and O. F. Tucker, Casper.

First oil company to join the current exploration activity for trona in southwestern Wyoming is Texota Oil Company. The Denver firm will drill two 1,500-foot trona wells in Sweetwater County as the first of a projected series. The first well is located in the northeast quarter of Section 18, T. 15 N. and R. 107 W. The second will be in the southeast quarter of Section 30, T. 15 N. and R. 107 W. Several major chemical firms are also investigating trona property in the area. (See MINING WORLD's trona map, page 26, April 1960)

British Columbia Prospectors May Total 600 This Season

A half hundred of the world's big mining firms are expected to spend some $4,000,000 or $5,000,000 on exploration and development in British Columbia this year. About 600 prospectors are anticipated in the field this summer.

The boom is said to be caused by discovery of new deposits of molybdenum, iron, copper, nickel and silver in the northern part of the province, as well as the present political unrest in Africa and South America. Then, too, the proposed Pacific Northern railway from Prince George north to the Yukon border would open a region said to be rich in unexploited minerals.

Some of the large operators in Africa and South America are said to be seeking a safer political climate for their investments. Cerro de Pasco, major Peruvian copper producer, reportedly has optioned copper claims across the boundary in Yukon territory. One African firm already has opened offices in Vancouver.

Two Molybdenum Prospects Drilled in Australia

Consolidated Goldfields of South Africa Ltd. has been surface diamond drilling a molybdenum prospect in eastern Australia. Contact metamorphic type mineralization in limestone contains molybdenite, garnet, epidote, and minor sulphides.

North Broken Hill Ltd. is diamond drilling a stock-like granodiorite containing molybdenite veins near Charters Towers, Queensland. A number of narrow but high grade molybdenite veins with good strike length show on surface.

Norway Increases Output of Aluminum and Ilmenite

One of three large scale expansions currently being carried out to increase Norway's mineral processing facilities is that of Titania A/S at Tellnes, where a 1,000,000-ton per year ilmenite processing plant is scheduled to begin operations in mid-October. Annual output is estimated at 300,000 tons of ilmenite concentrate and over 22,000 tons of magnetite.

Titania is investing Kr 75,000,000 to develop vast deposits of ilmenite discovered by aerial survey about five years ago. Extensive diamond drilling in the area, about halfway between Flekkefjord and Egersund in southern Norway, indicated deposits contain at least 200,000,000 tons of ore. Since 1918 Titania has produced ilmenite concentrate from its deposits at Hauge, with last year's exports valued at Kr 25,000,000. The present expansion is designed to boost export value by about Kr 15,000,000 yearly.

The company also operates a pilot plant near Jossingfjord in western Norway to test an improved processing method which yields 74 percent titanium slag and metallic iron. If the new process is used at Tellnes the annual output of 300,000 tons of concentrate would yield 100,000 tons of pure iron, besides titanium, and triple the export value.

Another expansion is under way by Mosjoen Aluminium A/S which now has 160 electric smelting furnaces with a combined annual capacity of 32,000 tons. A further increase, to 48,000 tons per year, will be accomplished through a new project for which a Kr 60,000,000 loan has been approved. Implementation of the plan depends on getting sufficient electricity from state-owned hydroelectric plants. Total cost of the expansion is estimated at Kr 100,000,000.

Final stage of the expansion program for the state-owned A/S Aardal og Sunndal Verk, Norway's largest raw aluminum producer, has been reached. Total capacity of the company is now about 115,000 tons, with addition of the newest plant Aardall II which began operations a year ago. Next year, when the 32,000-ton Aardall III is completed, the output will be upped to nearly 150,000 tons yearly.

Swedish Display Scheduled During Copenhagen Congress

In conjunction with the 21st International Geological Congress in Copenhagen, Denmark, August 15-25, an exhibit of geophysical and geological equipment has been arranged by the Swedish Diamond Rock Drilling Company and the ABEM Company. The display will be shown in Stockholm, where many of the geologists are expected to visit during several conducted geological excursions planned before and after the Congress.

The Stockholm exhibition, open from August 1 to September 10, will feature a working model of the ABEM airborne electromagnetic prospecting system, the Craelius dip indicator, a core orientator and soil samplers.

Construction on Hindustan Aluminum Plant Commences

Ground has been broken at Pipri, India, for the multi-million dollar aluminum production complex of Hindustan Aluminum Ltd. One of the largest single private investments of a United States firm in a joint venture with an Indian firm, the project is scheduled to begin operation in 1962. Hindustan Aluminium was formed by the Birla interests of India and Kaiser Aluminum & Chemical Corporation, Oakland, California, which owns approximately 27 percent of the company.

The plant site in the Mirzapur district of Uttar Pradesh, about halfway between Calcutta and New Delhi, is within two miles of Rhihand Dam and hydropower station now being built. It is close to rich deposits of bauxite in the Vindhaya mountains at Amarkantak in the adjoining state of Madhya Pradesh, and in the Lohardaga area of Bihar state.

Construction has been started near the plant site on a new village to house the workers.

Anaconda Expansion Covers Chile, Mexico and U. S.

The foreign expansion program by Anaconda Company during the current year includes development of a new low grade open pit mine at Cananea, Mexico, as well as a sizeable program at its Chilean properties. These call for an increase in capacity of the concentrator at Chuquicamata, house and townsite construction there and at El Salvador.

Current studies for future improvements in Chile include a 7,500-ton-per-month copper refinery at Chanaral and a 5,000-ton-per-day open pit near the El Salvador mine.

In the United States, Anaconda is

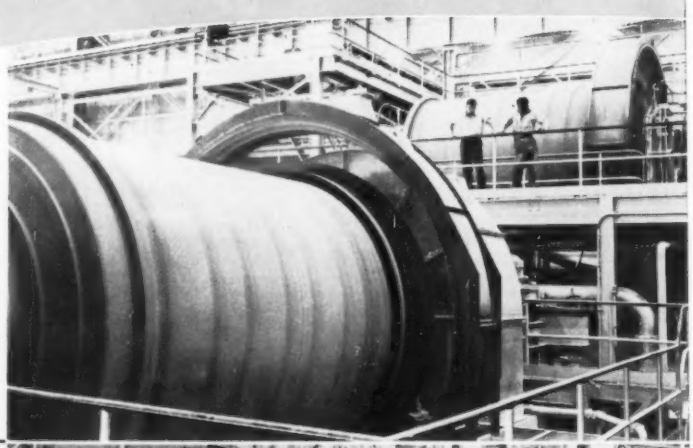
Mining Underway Below Stockholm Streets

All important records of the Swedish government will shortly be housed in a large series of excavations currently being mined beneath the center of Stockholm. Blasted out of solid granite, these facilities are being prepared by conventional trackless type mining methods. Drilling is done by a multi-drill, truck mounted Atlas Copco jumbo, with blasted rock being loaded by the new Traxcavator-mounted, Libu, side-dumping, open-sided bucket into end-dump Diesel trucks. Approximately 175 cubic yards of broken granite per hour are loaded in this manner. Trucks haul to surface up an inclined shaft for dumping.

grinding at el salvador

IS DONE BY 16 MARCY MILLS*

★ 4—10′ x 14′ MARCY OPEN END ROD MILLS
★ 8—10′ x 14′ MARCY GRATE DISCHARGE BALL MILLS
★ 4— 9′ x 12′ MARCY OVERFLOW TYPE REGRIND BALL MILLS



One of the eight 10′x 14′ Marcy Grate Discharge Ball Mills is shown in foreground, and one of the four 10′x 14′ Marcy Open End Rod Mills in the background.

Ball mill section consists of eight 10′x 14′ Marcy Grate Discharge Ball Mills

For efficient metallurgical performance, and dependable, low-cost mechanical operation, SPECIFY MARCY GRINDING MILLS.

The Company that cares enough to give you the best!

Manufacturing Division

MINE AND SMELTER SUPPLY CO.

DENVER 16 3800 RACE ST. | NEW YORK 17 122 E. 42nd ST. | SALT LAKE CITY 1 121 W. 2nd S. | EL PASO 1515 11TH AVE. | ALBUQUERQUE 701 HAINES N.W.

Licensed Manufacturers and Sales Agents in Canada, Australia, Sweden, England, South Africa
Sales Agents in Peru, Chile, Philippine Islands, Japan, New York City (for Continental Europe) and in principal cities of the United States.

deepening the Kelley shaft and completing other features of the mine project in Butte, Montana and plans construction of a 5,000-ton concentrator to treat sulphide ore at Weed Heights, Nevada. Originally, that plant was to treat only oxide ores. The dual plant operation will not increase copper production capacity but will extend the life of the mine many years.

The company also plans this year further modernization of the Anaconda, Montana, copper plant; its refinery at Raritan, New Jersey, and its fabricating plants. Construction of a new research laboratory is also part of the expansion program in which Anaconda plans to invest $35,000,000 this year.

SWEDEN—Capacity of the **Grangesberg** mining operation of **Stora Kopparbergs AB** is now double what it was before the start of a recent two-year expansion program. Extraction of ore has been increased from 85 to 95 percent, amounting to 20,000 tons of concentrate produced from what was previously waste. The mine has been rebuilt with a 62-meter headframe, and a concentrating plant built where magnetite is concentrated in four permagnetic separators and hematite in 160 Humphrey-spirals. Four top-speed filters are used in the dewatering process and two rod mills, of 75-tph. capacity, mill the ore to a size less than three millimeters.

SPAIN—As a result of new laws more encouraging to foreign participation in Spanish industry, some foreign investments are being made in mining firms, generally joining forces with existent Spanish companies. Among these is **Cia. Actividas Mineras,** in which the **Montecatini Company** of Italy has a 49 percent interest. A program of exploration, development and refining minerals—particularly tin and lithuim—is underway. Another new firm is **Sondeos, Perforaciones, Inyecciones Iberia Stump,** which has 50 percent foreign capital. The government has authorized 45 percent foreign participation in **Minas de Dubra,** and a new ore dressing plant to be built soon in Huelva will also have considerable foreign financing.

SICILY—Establishment of a regional sulphur company to take over, reorganize, and modernize present enterprises is the subject of a bill now before the Sicilian Regional Assembly. Private individuals and firms may invest in the company, but the controlling 60 percent will remain in the hands of public agencies, the **Enti Zolfi Italiania** (National Sulphur Agency) and the **SOFIC,** a local industrial financing group.

UNITED KINGDOM — **Aluminium Ltd.** is expanding its interests here by acquiring a 50 percent share in Enfield Rolling Mills Ltd., which operates a secondary aluminum smelter at Bradford, Yorkshire. A new company, **Alcan Enfield Alloys,** will be formed to operate the smelter and will be capitalized at £500,000. Scrap and primary aluminum will be used there to produce a large range of foundry alloys not normally produced by Aluminium Ltd.'s large subsidiary, **The Aluminium Company of Canada (ALCAN).**

YUGOSLAVIA — Bauxite output from the **Niksic** mines in Montenegro will be increased from 160,000 to 227,000 tons this year. New equipment to achieve the production goal will include trucks, excavators, locomotives and compressors. Principal difficulties in fully developing the mine, which has large reserves, are bad roads and its location about 20 miles from the railway line to the Adriatic harbor of Ploce. A road improvement program is scheduled in the next four years.

FRANCE—Steel production for the first five months this year showed an increase of about 17 percent over the same period last year. During May the output of 1,469,000 tons was about 20 percent higher than in May 1959, and some 40,000 tons greater than in April. Pig iron output showed about the same increase.

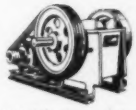
FINLAND—Full-scale development of uranium deposits at Eno, Askola and Perna has been started by the **Paukkanjanvaara** mining company. The extraction unit of the uranium plant, first of its kind in northern Europe, has just been completed. Initial production will go to Sweden and later output, probably, to other western European countries. Annual output is estimated at 30,000 tons of crude ore with a uranium content of 0.2 percent. Exploration for additional deposits will continue.

EIRE — Considerable progress in both underground development has been made at the **Mountain** mine of **Can-Erin Mines, Ltd.** in County Cork, where continuity of the ore structure of the 2,400-foot horizon has been definitely established. On the 800-foot level the bench was completed around the open stope east of the Man-Engine shaft and the drift, extending 300 feet west of the shaft, was rehabilitated. Track, air lines and water lines have been installed. On the 1,200-foot level the diamond drilling program was completed and showed the north-south ore body to be 275 feet long, with an average width of 55 feet. The new east-west ore body, also probed by flat diamond drill holes on this level, shows a length of 200 feet with an average width of 17 feet. Much of the north-south ore body was stoped on this level during former operations, but diamond drilling into walls and sampling on the backs indicated a grade in the nature of 2 percent copper. About 20,000 feet of additional drilling will be needed to complete the entire program. Reports indicate the original estimate of at least 6,000,000 tons of ore grading approximately 2 percent copper will be proved above the 2,500-foot horizon when this work is completed.

YUGOSLAVIA—Mining of silica continues at a steady rate after it was begun on a regular basis two years ago. Biggest deposits in the country are located in the northeastern part of Macedonia in the vicinity of Kratovo about 20 miles from the Zletovo lead-zinc mines. The entire deposit in the mountain area totals about 5,000,000 tons of silica, which occurs in white, rose, blue and gray. Deposits are situated in an eruptive mass of docite and andesite origin. Hardness averages

The Company that cares enough to give you the best!

Laboratory Equipment

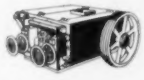


4"x 6" Massco Laboratory Jaw Crusher

Welded steel frame; manganese steel jaw and cheek plates; bronze bushed bearings; smooth jaws give better product and easier cleaning. Adjust for plate wear and product size by convenient hand wheel adjustment.

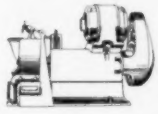
6" and 10" Massco Gy-Roll Reduction Crusher

Reduces ½" feed to as fine as 10 mesh in single pass. High capacity, low power consumption.



Laboratory Crushing Rolls

Sizes (Diameter x width): 8"x 4", 10"x 6", 10"x 8", 12"x 10" and 12" x 12". Adjustable roll space setting up to ¾". Double V-belt drive. Heavy, cast Meehanite frame absorbs vibration, results in long life.



Massco-McCool Pulverizers

Disc type grinder with a planetery movement. No gears. Will grind ¼" to 150 mesh in one pass.

Marcy Pulp Density Scale

Gives direct reading of weight; specific gravity of liquids, pulps, and dry solids; percent solids in pulp. Very accurate. Easy to clean.

MINE AND SMELTER SUPPLY CO.

3800 RACE STREET • DENVER, COLORADO
OFFICES AND AGENTS IN PRINCIPAL CITIES

about 500 Brinell, similar to that of silica in the Belgian Congo and the SiO_2 content is about 98 percent which makes drilling very difficult. The mineral, part of which is exported, is mainly used in pulverized form for grinding material, as balls in ball mills, and for similar purposes.

SWEDEN—**LKAB** is continuing its change from open-pit to underground mining at its **Kiruna** operation where a new shaft with a sorting plant inside the central works is now in use. Two remaining shafts will be ready this year. The company also plans two more shafts in order to raise production to 15,000,000 tons per year. The company is continuing its prospecting programs at Mertainen, Gruvberget, Sappavaara and Levaniemi.

BRAZIL—In order to concentrate on development of its iron ore resources **St. John d'el Rey Mining Company Ltd.** is selling its gold mining property in Minas Gerais to a new Brazilian-controlled firm. As part of the agreement St. John will retain 25 percent of the new company's preferred stock and will make a $1,000,000 loan to finance the current three-year cost-reduction and expansion program. The Brazilian property 17 miles south of Belo Horizonte includes the **Morro Velho** and **Espirito Santo** mines, equipment, hydro-electric plants, the Nova Lima-Raposos railway and over 46,000 acres of land. The new firm is headed by Dr. Fernando de Souza Mello Vianna. Exploration of St. John's **Aguas Claras** iron ore deposit, also near Belo Horizonte, was nearly completed by the end of last year. The first has spent a total of $2,184,000 on this project which resulted in proving a large high-grade ore body. Transportation of ore to the sea coast and other problems connected with exporting the ore are currently being studied by St. John.

MEXICO—A zinc refining plant with an annual capacity of 380,000 tons of concentrate will be built soon by **Zincamex S.A.** in Saltillo, state of Coahuila. The refinery will employ the horizontal retort process. Although some of the capital is provided by the government, Senor Bustamante, secretary of national patrimony, said this does not mean nationalization of the industry since state intervention in this field does not affect national or foreign private enterprises which have been unable to make investments in this industry.

CHILE — Officials of the **Anaconda Company** and **Kennecott Copper Corporation** have indicated that their firms' planned investment for expansion of copper mining facilities in Chile will be considerably greater than the $250,000,000 increase sought by President Jorge Alessandri. President Alessandri said he hoped that the two firms would invest that amount in the next four years to help Chile recover from the effects of recent earthquakes. The multi-million dollar program planned by Anaconda at its **El Salvador** and **Chuquicamata** mines will modernize and enlarge production and processing facilities, as well as improve living quarters for workers. Kennecott intends to spend about $200,000,000 to increase production at **El Teniente** copper mine operated by its subsidiary, **Braden Copper Company.** The project is designed to increase present 180,000 ton-per-year output by another 100,000 tons.

ARGENTINA—Location of new uraniferous outcrops has been reported in the province of Salta near Tonco and the Amblayo River. Considered the largest area yet located in this country, it is a mineralized zone about 100 kilometers long and 50 kilometers wide.

MEXICO—Geologists of the **Mexican Atomic Energy Commission** have located some extensive uranium deposits at Sierra de la Cal in the Nazaz municipality in Coahuila. Studies to determine their importance have begun. The commission recently took over some small uranium deposits at Punta Penasco, Sonora. No work has been done on these deposits.

ARGENTINA — Exploration expenses for the **Farellon Negro** mine project in the province of Catamarca are estimated at 14,000,000 Pesos, while the cost of constructing a road to the mine will be about 4,000,000 Pesos. **The National Bureau of Mines** is supervising the operation which will reach 1,500 meters of underground development. Metallurgical studies are being conducted by the **Rhienstahl Industrie Planung GmbH** of Dusseldorf, Germany, at a cost of $120,000, to determine economical processes for recovery of manganese, gold and silver.

Experience the world over

Over thirty-three years of aerial survey work all over the world go into the planning and execution of every Fairchild project. So, whether the job is in Peoria or Peru, in New Jersey or New Guinea, you can be sure . . . if you need it done fast, and right the first time . . . you can depend on Fairchild.

Aerial photography
Topographic contour maps
Airborne geophysics
Marine Sonoprobe surveys*
Electronic positioning services
*A trademark

FAIRCHILD
AERIAL SURVEYS, INC.

LOS ANGELES, CALIF.: 224 E. Eleventh St. • NEW YORK CITY, N. Y.: 9 Rockefeller Plaza • CHICAGO, ILL.: Daily News Plaza, 400 W. Madison St. • BOSTON, MASS.: 255 Atlantic Ave. • BIRMINGHAM, ALA.: 2229½ First Ave., No. • DENVER, COLO.: 2620 So. Ivy • WASHINGTON, D.C.: 1625 1 St., N.W. • ROME, ITALY: Via Bradano 22

CHILE — **Standard Magnetite Company**, headquartered in New York, has been formed recently to pursue a basic innovation in steel making. The company now owns iron ore properties in the United States and South America and is currently planning acquisition of additional reserves and producing properties. The board of directors includes executives of top mining and metal concerns in the United States, whose combined capital totals more than $400,000,000. Head of Standard Magnetite is Dr. David Hill, whose work as a physicist includes collaboration on the first chain reactor. Directors include Howard Steven Strouth of **Stanleigh Uranium Mining Corporation** and **Andacollo Mines** in Chile; Frank Howard Sr., **Howard Foundry**; Stanley Kaplan, **Sun Steel**; Roy Kropp, **Kropp Steel**; Henry Nelson, **Menasco Manufacturing**; Frank Rackley, **Jessop Steel**, and Roger Gay, former president of **Bristol Brass.**

BOLIVIA—The six-day strike of 3,400 workers at the state-owned **Bolivia Mining Corporation** tin mine was ended when the company made payment of overdue wages. The mines were operated by **Patino Mines & Enterprises Consolidated Inc.** before being nationalized in 1952.

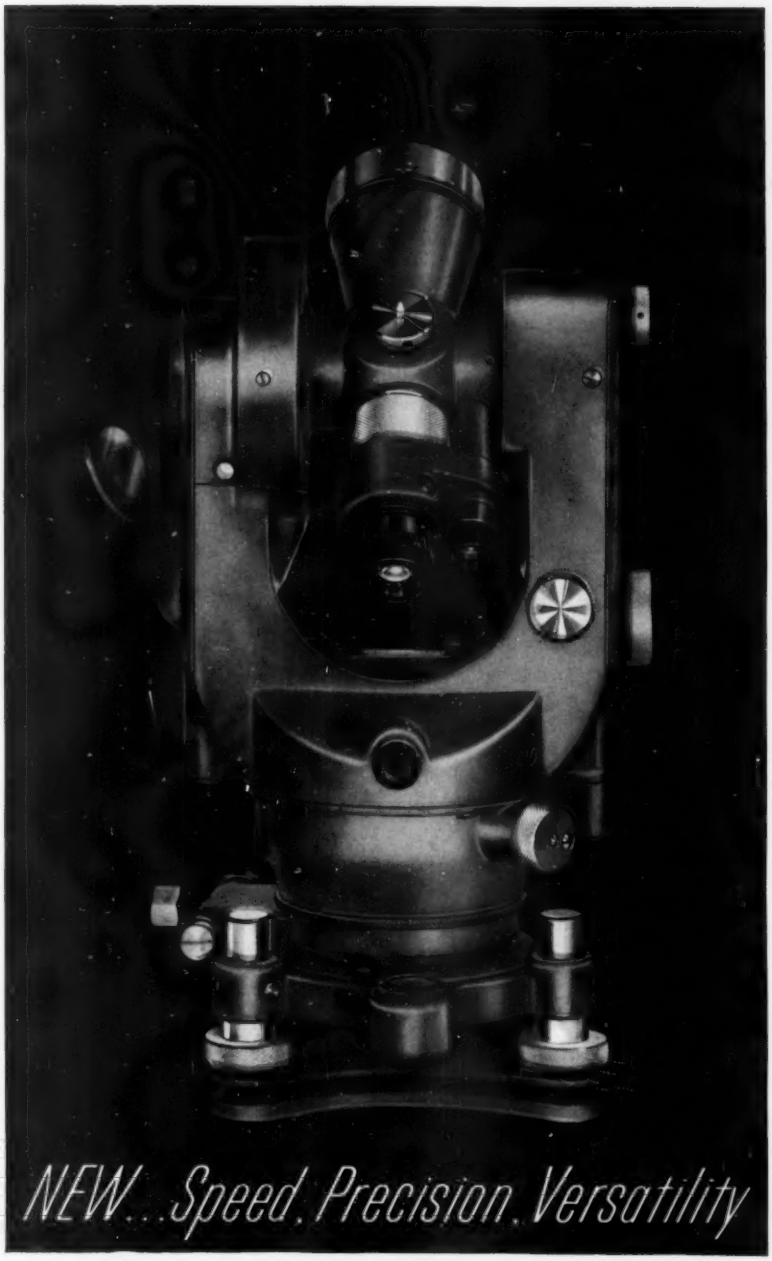
URUGUAY — An expansion program that will almost double its aluminum fabricating capacity is being initiated by **Aluminio del Uruguay, S. A.**, one of nine Latin American subsidiaries of **Aluminium Ltd.** Installation of a 1,500-ton extrusion press is scheduled this year and an 1,800-ton-capacity rolling mill will be added early next year. The Montevideo plant produces aluminum sheet, foil and extrusions.

PERU — **Northern Peru Mining and Smelting Company** is engaged in an exploration program at its newly purchased 500-acre copper claim containing high grade copper veins in the zone of Michiquillay, district of Eucanada, state and province of Cajamarca. The property was purchased from a prospector, Guillermo Bazan Peralta.

MEXICO—A new fluorspar mill was completed recently at Esqueda, Sonora, to process ore from the mines in the area which were reopened recently. The new plant, about 45 miles south of Agua Prieta, was built by the **Esqueda Company** which purchased the mines after they were closed in 1955. Development at the mines included sinking of a 300-foot shaft and 3,000 feet of drifting and cross-cutting. The plant will produce acid grade fluorspar of 97 percent purity. Formerly, metallurgic grade fluorspar of 60 percent purity was shipped from the area. The higher grade, shipped in powder form, makes it economically profitable to resume the mining operation.

PERU — **Consorcio Minero del Peru, S. A.** will soon begin development of lead-silver and copper veins in the Muquicochi hills in the Otoca district in Lucanas, Ayacucho. The company is also exploring a lead-silver deposit in the Yuracmayo district of San Mateo, and on Prucuchua Hill.

MEXICO—Two new shafts have been opened at the **Dolores** mine at Angangueo, Michoacan, resulting in safer mining conditions and improved ventilation.



WILD T-1A OPTICAL REPEATING TRANSIT

All the ruggedness, simplicity, and trouble-free performance of the world renowned T-1...plus the convenience and extra speed of automatic vertical collimation setting.

Vertical angles can be read immediately after set-up. No need to center vertical circle level...no cleaning or maintaining moving parts.

Highway, mining, or any other surveying project, day or underground, becomes routine with the Wild T-1A.

Upper and lower motions for setting on zero and for repeating. Built-in optical plummet.

Write for Wild Booklet T-1A.

In Canada: Wild of Canada Ltd., 157 Maclaren St., Ottawa, Ontario

WILD
HEERBRUGG
INSTRUMENTS, INC.
Main at Covert St. • Port Washington, N.Y. • POrt Washington 7-4843
FULL FACTORY SERVICES

Now "trade" dead weight for payload..and haul 40% faster!

Heap-load the big-target Payhauler body in minimum time. Strong rock-ribbed corrugations absorb shock—resist wear and distortion. Choose the "95" with power-shift Torque-Converter, or 9-speed air-shift transmission.

New strength-multiplying corrugated body design results in payload-gaining weight reduction of both International Payhauler models. New "95" capacity is increased to 27 tons—and the new "65" becomes the only 19-tonner on the market!

Look at those exclusive, rock-ribbed body corrugations! International applies this strength-multiplying principle to reduce Payhauler® body weight by an amazing 30%! You "trade" 2½ tons of power-wasting dead weight for 3 bonus tons of payload capacity in the new 95 Payhauler!

New high-torque, high-output diesel power high-balls 27-ton payloads up to 40% faster than the former "95" could haul only 24 tons! The new 375 hp DT-817 International diesel engine gives the new 95 Payhauler the wallop of 40 extra turbocharged "horses."

Prove to yourself that top load-carrying capacity plus top power-to-weight ratio give 95 Payhaulers tremendous profit-earning advantages. Add up other big Payhauler exclusives: fast reverse, up to 7.1 mph. for spotting speed; big-target bodies for loading zip; 11-second inverted-hoist dumping; load speeding safety of torqmatic braking and positive power-steering! Let your International Construction Equipment Distributor demonstrate!

International® Construction Equipment

International Harvester Co., 180 N. Michigan Ave., Chicago 1

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers and Bottom-Dump Wagons . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

AFRICA

CONGO REPUBLIC—Despite political changes now taking place, **Societe Miniere de Beceka** hopes to sell 10,000,000 carats of diamond bort this year, based on sales during the first few months of 1960 which are higher than for the same period in 1959. The company has concluded barter contracts with American purchasers securing bort deliveries until the end of 1961 against purchases of surplus agricultural products. The company net profit last year was 391,300,000 Belgian francs compared with 315,550,000 in 1958, with a total net dividend of 275 francs compared with 220 per share previously. Beceka markets its diamonds through the **De Beers Central Selling Organization,** with barter arrangements made in conjunction with that group. The contract comes up for renewal at the end of the year.

UNION OF SOUTH AFRICA — A world tunneling record for a standard 11 x 13-foot haulage tunnel was set recently at Allenridge by **Loraine Gold Mines Ltd.** where crews using Eimco 40H RockerShovels drove 2,965 feet in 26 working days. The new mark, which exceeds the previous record by nearly 300 feet, was set by Loraine while driving two parallel tunnels about 300 feet apart and connected every 500 feet by crosscuts. Best footage in one day was 120 feet, with 20 rounds, averaging six feet per round, drilled, blasted and loaded in 24 hours. Tunnel headings were 17,500 and 20,000 feet away from main haulage shafts. The record set by Loraine is the second such world record made in recent months using equipment made by **Eimco Corporation** of Salt Lake City, Utah. Last December **Utah Australia Ltd.** and **Brown and Root Sudamerica Ltd., Utah Construction Company** subsidiary, set a world tunnel mark in Australia using 40H RockerShovels.

REPUBLIC OF TOGOLAND—Small bauxite deposits have been reported in the Agou mountain region as well as indications of titanium near Sokode, but at present development does not seem economically feasible.

FEDERATION OF RHODESIA & NYASALAND—The largest Diesel electric locomotive in Africa arrived recently for use in hauling ore from the **Mindola** mine to the Nkana concentrator. Said to be the largest locomotive ever exported by General Motors, it completed a 9,000-mile journey from Illinois. Al Gross travelled from America to put the locomotive into operation.

GHANA—The new development program made possible by a government loan will include run-of-mine development concentrated on the A.V.S. section where prospects have proved "favorable and encouraging", according to C. J. Burns, chairman of **Amalgamated Banket Areas Ltd.** The development is expected to increase production from the A.V.S. section and add to the gold ore reserves so that mine output will be three years ahead of the mill. Selected exploratory development as well as geological and drilling investigation of relatively unexplored areas will also be undertaken.

UNION OF SOUTH AFRICA—In the Barberton area of northeastern Transvaal, **Eastern Transvaal Consolidated Mines Ltd.** is conducting exploratory diamond drilling in the old **Mount Morgan** gold mine to test the ore body below the lowest development level.

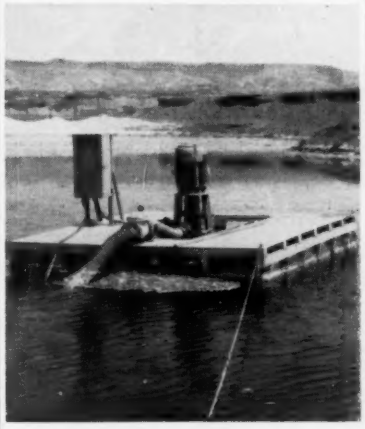
FEDERATION OF RHODESIA & NYASALAND—A new Copperbelt shaft sinking record of 415 feet in 30 days has been set by the **Cementation Company** at **Mulfulira West,** where **Mulfulira Copper Mines Ltd.** is engaged in a £14,000,000 expansion program. Sinking has been through solid but blocky granite. The company hopes to step the present speed up to 500 feet per month in order for the shaft to bottom at 2,950 feet toward the end of August. The 18-foot-diameter shaft, No. 14, will be the main ore hoisting shaft for Mulfulira West. The five-year expansion program will increase annual production from 100,000 to 150,000 long tons per year.

UNION OF SOUTH AFRICA—**Winkelhaak Mines Ltd.** is expanding its gold production capacity to 90,000 to 110,000 tons monthly with a fifth ball mill that will, like the others, grind run-of-mine ore in single-stage operation. An additional thickener tank, four agitators, and one filter are also being installed.

GHANA—A Ghanaian Parliamentary delegation in the Soviet Union has been sounded about the possibilities of Soviet help in building a hydro-electric station on the Volta River, for cheap power to develop a local aluminum industry, in addition to Soviet technical help in prospecting for minerals. **Kaiser Aluminum Corporation** of the United States, has already formed a consortium to consider building a hydro-electric power station and a smelting plant for Ghana's bauxite deposits. The Ghana delegation, however, is understood to have been impressed by the Soviet power stations on the Volga, which also provide for adequate navigation facilities. The Soviet government has indicated that it will consider sympathetically any specific requests for aid, and the delegation is expected to submit recommendations when it returns home. Terms have not yet been discussed, but it is assumed the Russians will extend the normal offer of long-term credits at 2½ per cent, repayable in 12 years after deliveries. In Ghana's case repayment will probably be made in terms of cocoa—which Russia is importing in increasing quantities as its current consumer program gets under way.

UNION OF SOUTH AFRICA—**Western Areas Gold Mining Company Ltd.** which began shaft-sinking in its ventilation components in January, and in the main component in March, had reached depths of 2,178 feet and 974 feet, respectively, early in May. From surface, geological formations are Pretoria shales and quartzites to 1,000 feet; dolomite to 2,700 feet, and lava to 3,300 feet, where the Ventersdorp Contact reef is expected to be intersected, followed by Elsburg Reefs from about 3,320 to 3,375 feet. If the present rate of shaft-sinking is continued, the production stage should be reached before the scheduled date in mid-1963.

MARINE ENGINEERING IS NOT OUR FIELD BUT—



OUR NAVY IS GROWING!

We're not a shipyard, so if you're interested in an atomic sub, a carrier, or even a tug, please don't come to us. If, however, you need a raft to float a pump in an acid pond, why not join the Barber-Webb navy?

Pictured above is one raft of the several we've launched recently. This one floats high and dry in the tailings pond at Texas-Zinc's Mexican Hat uranium mill on barrel floats that we coated with Paraline® FG. Other models are available.

Perhaps your operation doesn't require a raft, but if you do have corrosion problems we'd like to know more about them. *Combatting corrosion through the proper use of a suitable plastic is our only business.* You can rely on Barber-Webb for both quality materials and qualified information.

BARBER-WEBB

3864 SANTA FE AVE., LOS ANGELES 58
PHOENIX
SALT LAKE CITY SAN FRANCISCO

Your ONE source for

- **PLASTICS**
- **TANK LINING**
- **PIPE LINING**
- **ALL CORROSION AND ABRASION NEEDS**

® Reg. TM Barber-Webb

INDIA—A license has been granted by the Indian government to **Sandviken Jernverks AB** of Sweden for construction of a factory at Poona to produce Coromant hard steel. An Indian company, **Sandvik Asia Ltd.**, will be organized for the project which will be under Swedish direction. An investment of 8,000,000 Swedish crowns is reported for the project, which may be ready for operation in 1961.

MALAYA — **Tronoh Mines Ltd.** has made a bid to acquire the neighboring and smaller **Southern Tronoh Ltd.**, whose tin quota Tronoh has been handling. Southern Tronoh's present life is short but options exercised on land in the Sungkai area are expected to provide seven or eight years' work for one dredge. This will be a useful addition to Tronoh's reserves which are believed to be sufficient for eight to ten years on full production for the multi-dredge operator.

TURKEY—**The Empresa Italian d'Allestero** of Italy is studying possibilities of building an asbestos-cement plant in the Mihalliccik region between Ankara and Eskisehir, where there are indications of asbestos deposits.

ISRAEL—Intensive geophysical investigation, additional drilling for minerals and expansion of processing facilities has been urged by the Technological Advisory Board of the Ministry of Development. It is believed that there are good reasons for beginning development of Israel's iron ore deposits at Har-Ramin.

KOREA—The **Korea Tungsten Mining Company** is shipping 500 tons of scheelite to the United States this summer for sales on a consignment basis, at the request of the **Continental Ore Corporation** of the United States.

MALAYA—Production from tin mines totalled 3,994 long tons metal content in April, bringing the year's production so far to 16,250 long tons. During the second three-month quota period, which began in April, the Federation may export 14,156 long tons of tin as a result of increased export quotas. During the first four months of the year 19 new tin mines were allowed to start operations in Perak, Malaya's major tin-mining sate.

JAPAN—Six leading copper producers are negotiating to import copper concentrates from Haiti. The contract, reportedly the first for this mineral between the two countries, would involve importing between 96,000 and 144,000 tons over a four-year period.

MALAYA—All Indonesia's tin ore output will be shipped to Malaya for smelting by terms of a recent agreement between the Indonesian government and the **Straits Trading Company Ltd.** First shipment arrived at Penang in June and it is estimated that at least 1,000 tons of ore will be shipped each month for smelting at Butterworth.

ISRAEL—A recent field study in the Timna vicinity revealed certain geological features that are typical of other parts of the world where primary copper deposits are present at depth. The geological team was led by Professor Y. Bentner, director of the Israeli Geological Survey, who in 1950 discovered secondary copper ore in the Timna area which has been mined profitably for the last several years. These deposits had proven reserves of about 12,000,000 tons of ore with an average copper content of 1.4 percent. The study indicates the new sources could be developed at a depth of up to 200 meters. Further investigation by core test drills is being planned to evaluate economic importance. The study project was commissioned by **Israel Mining Industries,** the government-owned company operating the Timna copper concentration plant which began production in 1958. The Timna area of southern Negev is the ancient site of **King Solomon** mines.

LEBANON—Deposits of rich uranium ore have reportedly been located in the Lebanese mountains.

BURMA—Mineral exports from Tavoy during the first three months of this year totaled 454.95 tons, comprised of 169.35 tons of wolfram concentrate and 167.70 tons of tin concentrate.

MALAYA—The **Tien Thye Mining** is preparing to open a new gold mine in the Galas district of Kelantan.

Only **SPANG** can give you the best in *Strength, Service, Economy and Footage* in a Prosser-type

SWIVEL ROPE SOCKET

There are times when an ordinary rope socket will meet your needs. But there are too many times when you can't afford to risk trouble—when you require a rope socket that's precision made and utterly dependable under all conditions. This is the time you'll be glad to have a Spang Rope Socket on the business end of your string—

• • • AND HERE'S WHY SPANG'S BEST

■ Completely Heat-Treated for maximum toughness and hardness ■ Precision machined ■ High steel strength ■ Extra strong joint ■ Carefully finished inside bore ■ Perfect setting for cable ■ Socket neck grooved for the use of fishing tools ■ Made by the country's oldest and largest manufacturer of cable tools

FIRST CHOICE OF DRILLERS EVERYWHERE

SPANG & COMPANY

DEPT. M-7 BUTLER, PENNSYLVANIA

For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.

MANITOBA—A new nickel discovery along the southwestern extension of the Mystery Moak structural feature has been reported by **National Malartic Gold Mines Ltd.** and **Consolidated Marbenor Mines Ltd.** The companies recently located by drilling a fairly large mass of peridotite containing nickel mineralization. Initial drilling of an anomaly returned an intersection of about 50 feet grading 0.80 percent nickel, within which 25 feet graded 1.17 percent nickel and 10 feet of 1.35 percent nickel. Pentlandite and violarite are the nickel bearing minerals. The companies have acquired 218 claims along a structural belt of 20 miles, in addition to 400 previously held by the two firms. Intensive exploration of the main zone has been started, with further drilling in the area. The property on which the nickel intersection was obtained is a mile southeast of Wabowden, a divisional railway point.

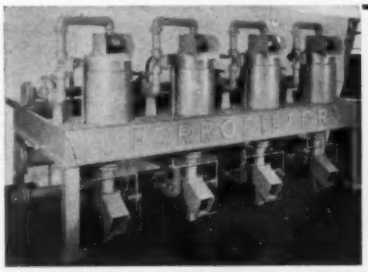
QUEBEC—Preparations have been started to sink a three-compartment production shaft on the Eastern Township property of **Solbec Copper Mines,** a subsidiary of **Hasting Mining and Development Company.** Cleaning and leveling of the mill has been started and plans call for a production goal of 1,000 tons a day. Surface drilling indicates over 1,000,000 tons of ore that averages 2.16 percent copper and 3.90 percent zinc, plus gold and silver to 500 feet.

ONTARIO—This year's production schedule for **Steep Rock Iron Mines Ltd.** is aimed toward shipping a total of 2,325,000 tons from its **Hogarth** and **Errington** mines. Some 1,800,000 tons will come from open-pit operations, from the underground Errington mine. Future plans call for an annual output of 3,000,000 to 4,000,000 tons.

QUEBEC—A $5,000,000 expansion program to improve processing and ore shipping facilities is being started by **Quebec Iron and Titanium Corporation** in its plan to increase production of titanium slag and iron. The company will rebuild one of its original five furnaces at Sorel, where the ilmenite is processed. Other expenditures will be for new equipmnt at Havre St. Pierre, North Shore port from which mined ore is shipped to Sorel.

BRITISH COLUMBIA—Mill capacity at the **Phoenix** copper mine near Greenwood has been increased to 1,000 tons daily. The mill handled an average of 679 tons daily in 1959. The open-pit mining operation yielded 175,945 tons of ore last year. The ore averaged 0.805 per cent copper, 0.034 of an ounce of gold and 0.193 of an ounce of silver per ton. Ore reserves are estimated at sufficient for four years.

NEWFOUNDLAND—The target date of March 1, 1961, has been set by **Atlantic Coast Copper Corporation Ltd.** for bringing its Newfoundland property into production. During the last year underground development has been in progress. Tonnage indicated by diamond drilling



Model 4-462 — 4 FERROFILTERS automatically cycled to control intake of slurry, draining backwashing for discharge of magnetic particles and turning magnets on and off. Flow may be upward or downward as required by the nature of the material. (Up flow shown)

One user gets a valuable Germanium by-product which is extracted, as part of the magnetic fraction, from a flotation concentrate. Another removes abraded iron after ball-milling to produce an acceptable grade of product.

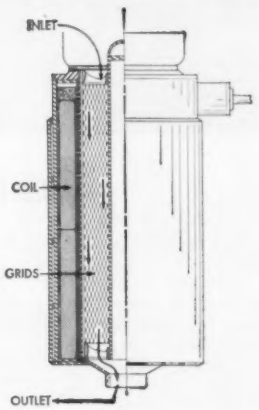
The magnetic particles are strongly attracted and held to the magnetized grids until the current is turned off. This releases them and they are washed down and discharged.

Consider FERROFILTERS for recovery of values and also for removing iron contamination. Non-automatic and Dry FERROFILTERS also available. We'll be glad to work with you on any separation problem involving iron particles. Write us, giving full details.

S. G. FRANTZ CO., Inc.

368 Kline Ave. at Brunswick Pike
P. O. Box 1138 Trenton 6, N. J.

RECLAIM
EXTRA VALUE
from Slurries
with
FERROFILTER
MAGNETIC SEPARATORS



around the old mine workings operated in the 1880's is about 2,610,000 tons grading 2.11 percent Cu. The property is in the Notre Dame Bay area.

QUEBEC—The all-time safety record in North America for underground non-metal mining was broken this year by the **Canadian Johns-Manville Jeffrey** mine, largest asbestos mine in the world. In recognition of the achievement, the National Safety Council presented mine employees with its Award of Honor. In breaking the record, the 1,800 Johns-Manville employees worked 2,660,079 man-hours without a lost time accident over a 284-day period ending January 13, 1960. The Canadian record and that of the Province of Quebec were also broken. The mine also established a company record for safety.

ONTARIO—Production at the **Kashabowie** mine of **North Coldstream Mines Ltd.** will be increased gradually to 1,200 tons per day of milling grade ore which is running about 2 per cent copper. Since the mine was pumped out last February and underground mining resumed under new management, daily milling rate has been pushed up to 1,000 tons daily. The mine is located about 30 miles west of Fort William in the Thunder Bay district.

MANITOBA—A new station has been completed on the 29th level of the **Forty-Four Mines Ltd.** property and the shaft is expected to enter favorable rock, previously tested by diamond drilling, somewhere between the 31st and 32nd levels. On the adjoining property of **San Antonio Gold Mines Ltd.** work is proceeding on the 10th level. On the 9th level, 314 feet of ore of a 0.36 ounce grade across five feet has been developed, adding to the 269 feet on the same level developed late last year. Combined ore reserves of the two mines at that time amounted to 274,000 tons, of which 74,000 were on the Forty-Four property. The latter firm is a subsidiary of San Antonio.

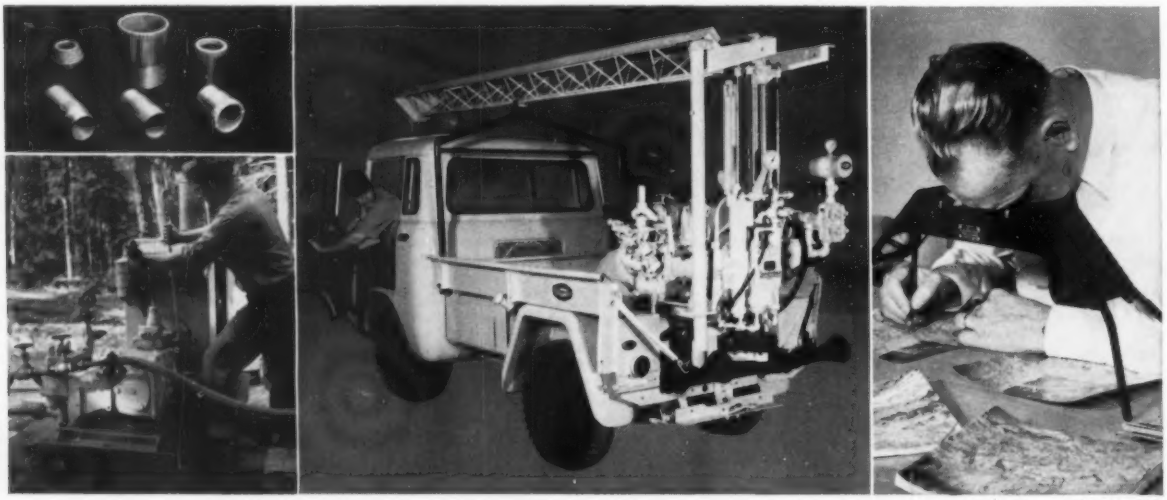
NORTHWEST TERRITORIES—**Taurcanis Mines Ltd.** in lower level work at its gold property has found ore in sections of the Mathews vein that were below ore grade on the 325-foot level. A raise 460 feet south of the shaft on the 475-foot level averaged 1.03 ounces per ton for a length of 60 feet over a width of 4.2 feet, while a raise on the 625-foot level has averaged 2 ounces per ton by chip sampling.

ONTARIO—Fifteen geological field parties are being sent out this year by the Ontario Department of Mines. The Big Trout Lake area in the Patrician portion of Kenora district; Dome township at the east end of Red Lake camp; the Lac Des Mille Lacs area in the Thunder Bay district; the Port Coldwell area and the Flanders Lake area are some of the areas being examined.

QUEBEC—New copper and copper-zinc discoveries made in the Val d'Or district during the last year include those by **Radiore Uranium Mines Ltd.** in Isle-Kieu township; **Daniel Mining Company Ltd.** in Daniel Township, **Newmont Mining Corporation of Canada Ltd.** and **Lynx Yellowknife Gold Mines Ltd.** in Galinee township.

ONTARIO—Successful bidder for the remaining uranium contract of **Stanrock Uranium Mines** under offers called by the bankruptcy was **Rio Tinto Mining Company of Canada Ltd.** The contract, covering 6,283,685 pounds of uranium oxide, will mean extended operations for Rio Tinto's **Rio Algom** mines.

CANADA—A new metal called scandium has been added to the list of metals produced in Canada. Scientists working for **Rio Tinto Dow** in Ontario have produced the rare metal in the process of extracting thorium from the waste liquors discarded from the district's uranium mines. Rio Tinto Dow has produced and sold only two pounds of the metal—which is worth between $3,000 and $4,000 a pound. A laboratory curiosity at the moment, scandium has certain properties in common with other metals and certain properties of its own. However, just what part it will play in the future is yet to be determined. The metal was produced by Rio Tinto Dow in a concentrate in pulp form. The concentrate was shipped to a company in the United States which turned it into metal and which sells it in 10 to 100 gram lots to laboratories for experimental work. The metal is No. 21 on the atomic scale, has an atomic weight of 45.10, a specific gravity of 2.48, and a melting point of 1,350 degrees centigrade.



Adv. No. 152

Longyear

PRODUCTS: Diamond core drilling equipment and supplies (center: *Unitized* Longyear "24" drill rig on 4-wheel-drive Jeep) . . . Longyear diamond bits . . . Longyear multi-speed drilling pumps . . . Longyear Wire Line.

WORLD WIDE SERVICES: *Contract Drilling*—Wire Line and conventional core drilling by experienced drill crews with modern equipment—to date: over 1 million feet with Wire Line . . . *Consulting*—Geological and mining consultation . . . Air Photo Interpretation (photogeology, road and site planning) . . . Valuation of mining property for loans, leases, sale . . . Mineral exploration and appraisal.

Longyear

E. J. LONGYEAR COMPANY
Minneapolis 2, Minnesota, U.S.A.

Member: Diamond Core Drill Manufacturers Assn.

CANADIAN LONGYEAR LTD., NORTH BAY, ONT./LONGYEAR ET CIE, PARIS, FRANCE/LONGYEAR N.V., THE HAGUE, HOLLAND/LONGYEAR de MEXICO, S.A. de C.V., SAN BARTOLO, MEXICO

NORTHERN TERRITORY—**Territory Enterprises Pty. Ltd.** has completed seven years' operation of the Commonwealth government's uranium project at **Rum Jungle.** Production of uranium oxide decreased somewhat in the last year to 332,495 pounds, due to treating of ore of slightly lower grade. Continued exploration has resulted in location of a new ore body at Rum Jungle Creek South, the extent of which is not yet defined. The firm is a wholly-owned subsidiary of **Consolidated Zinc Pty. Ltd.**

NEW SOUTH WALES — Exploration work by **Lake George Mining Corporation Ltd.** has produced little to promote any extension of the mine's life, now estimated to be only two and a half to three years.

REPUBLIC OF THE PHILIPPINES—Mining production of **Benguet Consolidated Mining Inc.** during May was 107,846 tons of ore milled; 21,064.164 ounces of gold produced, and 7,773.60 ounces of silver produced.

QUEENSLAND — **Consolidated Zinc Ltd.** has received authority to prospect over 440 square miles in the Mt. Morgan and Rockhampton area, a survey undertaken as part of the company's normal exploration for new sources of metals. Investigation will be carried out in association with **Mt. Morgan Ltd.,** a copper and gold producer operating at Mt. Morgan some 40 miles from Rockhampton.

NORTHERN TERRITORY—Development work on the **Orlando** prospect of **Peko Mines N. L. Ltd.** has been encouraging but much more work is necessary before overall evaluation extraction rates and milling problems can be considered. The main difficulty is an unusual depth of oxidation with subsequent redistribution of values by leaching. The main crosscut on the 380-foot level has passed through 65 feet of lode material which was found to be throughly leached and contained only residual values. Generally, however, the outlook for the prospect is good, and the lode structure is now exposed over a strike length of more than 800 feet, and average width of about 70 feet offers an opportunity for developing worthwhile bodies for extraction. Peko Mines recently contracted to deliver 30,000 tons of copper concentrate per year, equal to about 7,400 tons of refined copper, over a seven-year period to Japan. The contract period is for at least seven years with provision for extension thereafter.

SARAWAK — To maintain or increase Sarawak's output of bauxite, which was valued at $4,000,000 last year, a detailed mapping of the Sematan-Lundu-Tanjong Datu area in the First Division is being carried on. Government geologists will work in cooperation with the prospecting staff of **Sematan Bauxite Ltd.** on the project. Dr. F. B. Wolfenden of the government has already begun work in the Sematan bauxite area and he will be joined later by his colleague, Dr. N. S. Haile.

15 SIZES OF PACIFIC® SCRAPERS

Model	Size	Weight
2A	26″	480 lb.
2A	30″	510 lb.
2A	34″	550 lb.
AB	36″	775 lb.
AB	42″	850 lb.
AB	48″	960 lb.
AB	54″	1080 lb.
3B	36″	1400 lb.
3B	42″	1540 lb.
3B	48″	1730 lb.
3C	60″	2590 lb.
3D	48″	2030 lb.
3D	60″	2865 lb.
3D	72″	3700 lb.
3D	84″	4000 lb.

U. S. A. Pat. No. 2716824 • Patented Canada 1957
Manufactured in Canada at Sorel, Quebec

Scrapers are a specialty with us. Write today regarding your scraping problems. Send for Bulletin No. 287 giving specifications, complete information.

Use Pacific Sheave Blocks, Sheave Anchors, "Round-The-Corner" Sheave Blocks, Jaw Crushers, Bit Knockers and Pacific Wearing Parts.

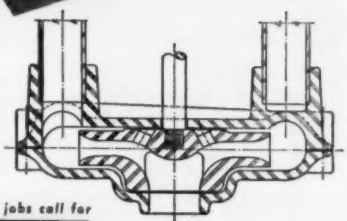
ALLOY STEEL & METALS CO.
1848 East 55th Street, Los Angeles 58, California
Mailing Address: Box 58323 Vernon Station
Los Angeles 58, California

1. A model and size to suit every mining system.
2. In service in practically every mining area throughout the world.
3. They stand up under the toughest service conditions.
4. They help you move more muck at less cost.

gritty, corrosive solution doesn't faze these Nagle® pumps

These two 5″ type "SWOB" Nagle vertical shaft centrifugal pumps are giving excellent service in a Michigan metallurgical plant. They are designed to give years of service where ordinary pumps would give only months of service. All submerged parts are of corrosive and abrasion resistant materials. There are no bearings below the floor plate. No stuffing box to worry about. Pump entrance is at bottom of casing so that solids cannot settle around impeller when pump is not operating. Nagle "SWOB" pumps are available 1″ to 8″, capacities to 1800 GPM, heads up to 100′. Many of these pumps are cutting costs in chemical and metallurgical plants.

Nagle Pumps, Inc., 1250 Center Ave., Chicago Heights, Ill.



Tough jobs call for Nagle PUMPS FOR ABUSIVE APPLICATIONS EXCLUSIVELY

Nagle builds a complete line of vertical and horizontal shaft pumps for handling abrasive, corrosive or hot slurries or liquids—send for Nagle Pump Selector.

PROFESSIONAL DIRECTORY

One-Inch Card, $90 Yearly—½-Inch, $60 Yearly, Payable In Advance.

CONSULTING ENGINEERS

BURBRIDGE—PYBURN
Consulting Engineers & Geologists
Mining—Petroleum
Southwestern U. S. & Latin America
Mills Bldg., El Paso, Texas—Tel. KE 3-4741

CHAPMAN, WOOD AND GRISWOLD
Mining Engineers & Geologists
P.O. Box 8302 Albuquerque, N. M.
525 Vernon Drive Vancouver 6, B. .C
Cable: CHAPWOLD

COWIN & CO., INC.
Mining Engineers and Contractors • Consulting Appraisal Reports • Shaft & Slope Sinking • Mine Development • Mine Plant Construction.
1-18th Street, S. W. Birmingham, Ala
Phone ST 6-5866

C. P. KEEGEL
Mining & Metallurgical Engineer
Administration Appraisal
1721 So. Fourteenth St. Tel. DUdley 4-6981
Las Vegas, Nevada

KELLOGG EXPLORATION COMPANY
GEOLOGISTS—GEOPHYSICISTS
Magnetic Seismic
Electromagnetic Radioactivity
3301 North Marengo Avenue
Altadena, California Sycamore 4-1973

LOTTRIDGE-THOMAS & ASSOCIATES
Professional Engineers
705 Judge Building
SALT LAKE CITY 11, UTAH

MERRILL W. MacAFEE
CONSULTING ENGINEER
CHEMICAL-METALLURGICAL-MINING
LUdlow 3-1778 7668 Santa Fe Ave.
FRontier 5-6145 Huntington Park, Calif.

MESABI ENGINEERING
711 NEW YORK BLDG.
ST. PAUL 1, MINN.
CA. 4-8833
MECHANICAL ENGINEERS, DESIGNERS, CONSULTANTS
MECHANICAL EQUIPMENT FOR THE CONTRACTING AND MINING INDUSTRY—ENGINEERED TO SUIT SPECIAL JOB REQUIREMENTS

STILL & STILL
Consulting Mining Engineers and Geologists
Room 24 Union Block Prescott, Arizona

O'DONNELL & SCHMIDT
Mining Consultants
165 Broadway Tel. BArclay 7-6960
New York 6, N. Y. Cables: EXAMIMINES

NEIL A. RICE
Mining Consultant-Registered Engineer. Examinations, Valuations, Mining Methods, Cost Cutting Surveys, Mineral and Oil and Gas leases.
512 E. Roanoke Ave. AMherst 5-7854
Phoenix, Arizona

TURNER & ASSOCIATES
Consulting Mining and Water Geologists
350 East Camelback Road, Phoenix, Arizona
Crestwood 4-2262

WISSER AND COX
GEOLOGISTS—ENGINEERS
investigations and consultation
RESOURCES—EXPLORATION—OPERATIONS
VALUATIONS—INVESTMENTS—UTILIZATION
55 New Montgomery St., San Francisco, California
YUkon 2-1436 cables: GEOLOG

WOLFE & ASSOCIATES
Geologists
Exploration-Valuation-Mineralogy
6518 Ledbetter St. Houston 17, Texas
Tel. OLive 4-1322 Cables: WOLMAC

CHEMISTS, SAMPLERS, SHIPPERS' REP'S

ARIZONA TESTING LABS
Chemists — Spectroscopists — Assayers
Box 1888 817 W. Madison Phoenix
Box 2508 1516 East 20 St. Tucson

ORE SHIPPERS' REPRESENTATIVES
at Smelters & Seaports
(Pacific Northwest)
Samplers Assayers
BENNETTS CHEMICAL LABORATORY, INC.
901 So. 9th Tacoma 5, Wash.
Est. 1913 Inquiries Welcome

THE COLORADO ASSAYING CO.
ASSAYERS, CHEMISTS and SPECTROGRAPHERS
Est. 1900
Gold and Silver $2, Copper $1, Uranium $7.50. Send for free copy of our Mineralogist Pocket Reference Giving Detailed Information on all Principal Ores.
2244 BROADWAY—ALSO P.O. BOX 298
DENVER 1, COLORADO

DICKINSON LABORATORIES, Inc.
Assayers—Chemists—Metallurgists—Umpires
Shippers Representatives at Local Smelters
Representatives at Mexican Border
Points for Shippers of Manganese and Fluorspar
P.O. Box 7006 El Paso, Texas

ASSAYS. Complete, accurate, guaranteed. Spectrographic. Over 55 elements including rare earths and radioactives. $8. REED ENGINEERING. 620-Y So. Inglewood Ave., Inglewood 3, Calif.

Wood Assaying Co., Henry E.
Established 1878
ASSAYERS and CHEMISTS
733 W. Colfax Denver 4, Colorado

DRILLING COMPANIES

DIAMOND DRILL
Contracting Company
S. 18 Stone, Spokane 31, Wash.

- "SUPER PIONEER" hand portable core drills
- "K & S INTERNATIONAL" standard surface drills
- "DIA-HARD" Core Barrels
- And a complete line of "Super Pioneer" and standard diamond drilling accessories.

R. S. MC CLINTOCK CO.
Diamond Core Drilling
Diamond Core Bits & Accessories
Spokane, Wash. Globe, Arizona

EXPLORATORY DRILLING—GROUTING
ROCK BREAKING
J. F. WHALEN
Mining Engineer
Available for Consultation on Exploration & Mining Problems
P. O. Box 4056
Boise, Idaho Phone 4-0098

VAUGHAN DIAMOND DRILLING
World-Wide Consultants
Foundation, Grouting, Core Drilling, Wedging and Recovering Hole. We are in the Business for Trouble and have Experienced Trouble-Shooters for every job.
Head Office: Beaverdell, B. C., Canada
Cables: Vaughan

FIJI ISLANDS—**Emperor Gold Mining Company Ltd.** is just completing a new crushing, washing, sorting and grinding section of the gold mill as part of the current project to increase capacity at its Vatkuola operation. A major program of flotation research and accelerated mine development is starting soon.

REPUBLIC OF THE PHILIPPINES—The ore reserve position of **Paracale Gumaus Consolidated Mining Company** this year indicates an increase of 17.47 percent over that of last year, totalling 107,255 tons. A post-war production record was set during 1959, the annual report disclosed. The output of 1,813,744 Pesos worth of gold bullion represents an increase of nearly 20 percent over the previous year.

NEW SOUTH WALES—Construction of the new lead and zinc smelter of **Sulphide Corporation Pty. Ltd.** at Cockle Creek is well underway and operations are scheduled to start in the latter half of 1961. The smelter will use the vertical process developed by **Imperial Smelting Corporation** of Great Britain for simultaneous recovery of zinc and lead.

QUEENSLAND — Production of rutile and zircon by **Titanium and Zirconium Industries Pty. Ltd.** from beach sands at Stradbrokee Island has been at a low level because of continued weakness in the rutile market.

NEW SOUTH WALES—The state government has been requested to interest Japanese aluminum producers in bauxite depists in the Inverell area where reserves are said to be quite large, with alumina content averaging 40 percent. New South Wales Minister of Mines Simpson was asked to approach three aluminum producers during his recent visit to Japan. Transportation and freight costs have been a deterrent to developing the reserves, said to be more extensive and richer than those in Western Australia.

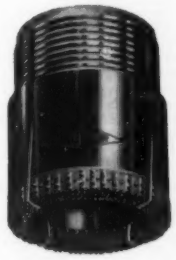
WESTERN AUSTRALIA—Gold producers in Western Australia during 1959 paid £A 2,093,984 in dividends, an increase over the previous year, according to R. J. Agnew, president of the Chamber of Mines of Western Australia, Inc., who spoke at the annual meeting in Kalgoorlie. During the year 2,959,202 tons of ore were treated, a decrease of 61,870 tons from the year. Production of 860,969 ounces was 131,850 ounces less. Gold recovered per ton of ore was 5.82 dwts. compared with 5.79 dwts. in the previous year.

NORTHERN TERRITORY — Preliminary tests by **United Uranium N. L.** indicate that efficient extraction of both gold and uranium ore can be expected from ore at its **Coronation Hill** mine about 150 miles southeast of Darwin. About $2,250,000 worth of uranium was extracted from the mine during the last year, stockholders were told at the company's annual meeting in Melbourne.

REPUBLIC OF THE PHILIPPINES—First export shipment of zinc concentrates produced by **Surigao Consolidated Mining Company** at its Surigao province property was made recently to the United States. A portion of a 15,000-ton-order, the shipment consisted of 1,206 dry short tons of concentrate, estimated to contain 1,225,906 pounds zinc; 1,568.6 ounces of silver and 168.9 ounces of gold with a total value of Pesos 340,000.

PAPUA—Detailted testing by **Pacific Island Mines Ltd.** in the oxidized zone of its Misima Island property has continued to locate further extensions to the new lode system found earlier this year and has exposed three lodes spaced some 300 feet apart. Gold values appear to be persistent and in places encouraging values have been encountered. Although operations are insufficiently advanced for estimates of average grade and tonnage, current work indicates that the lodes have minimum combined surface length of 1,500 feet and extend to at least 150 feet deep, with exposed lode widths ranging from 5 to 45 feet. As well as higher grade structures, there are large tonnages carrying lower gold concentrations, where large-scale open-pit mining may be feasible. Development work has been concentrated in the Imgubinaina Creek Area. The company plans to install a small production unit and to expand current prospecting into new territory on Misima. The pilot plant operation to determine ore reserves and most efficient treatment methods may be modified later into a full scale unit to treat 40 to 50 tons of oxidized ore per day.

ANNOUNCING



ACKER DIAMOND BITS

AN ALL-NEW QUALITY LINE

Now, a quality line of moderately priced diamond bits takes its place in the distinguished Acker line of drilling equipment.

Acker manufactures and stocks a variety of diamond bits including a complete line of thin-wall diamond bits.

Acker diamond bits will do the most exacting job better and more economically. They're expertly designed and crafted of the finest materials and workmanship in Acker's new, ultra-modern plant. Complete inspection and quality control plus Acker's impeccable reputation for reliability and dependability are your guarantee of satisfaction. Try an Acker bit on your next job, you'll be pleased with its rugged construction and ability to stand-up under the most severe conditions.

FREE

Write today for free 28 page diamond bit and core barrel Bulletin 10

ACKER DRILL CO., INC.

P. O. Box 830
Scranton 2, Pa.

Manufacturers of a complete line of: Soil Sampling Tools • Rotary Earth Augers • Diamond & Shot Core Drills • Earth Boring Equipment • Diamond Bits • Drilling Accessories & Supplies

SuperDuty DIAGONAL DECK No. 6 CONCENTRATOR TABLE

DEISTER OVERSTROM

Unmatched Mineral Concentrating Efficiency

The SuperDuty® DIAGONAL-DECK® concentrating table produces highest grade concentrates with maximum recoveries and minimum loss to tailings while greatly reducing the circulating middling load. The reasons for this outstanding efficiency are found in the perfection and complete balancing of all tabling factors—deck arrangements and action, head motion operation, and underconstruction stabilization. Send for Bulletin 118-C.

The Deister Concentrator Co., Inc.

The Original Deister Co., Incorporated 1906

925 Glasgow Ave., Fort Wayne, Indiana

The Market Place

COMPLETE EQUIPMENT FOR ALL MINE AND MILL OPERATORS

CONCENTRATING TABLES
8—Dunham Economy Type Tables, 50" x 11'9" decks.
8—Dunham half size tables
9—Deister super-duty diagonal deck standard tables

CRUSHING ROLLS
1—16" x 10" McFarlane
1—40" x 20" Cedar Rapids

DIESEL-ELECTRIC GENERATORS
1—15 KW Waukesha-Hesselman
1—30 KW Buda
1—75 KVA Caterpillar, D-13000
1—112½ KVA Caterpillar, D-17000
1—250 KVA Buda model 8D-CS-2505

AIR TUGGER HOISTS
1—Ingersoll-Rand Model DU
3—Ingersoll-Rand Model D6U
4—Ingersoll-Rand Model IH
14—Sullivan Model E-111
2—Ingersoll-Rand Model EUA
1—Ingersoll-Rand Model 10-H
4—Gardner-Denver Model MK
2—Joy "Turnbinair" Model F-113
1—Sullivan Model L-111
2—Ingersoll-Rand Model 10HR
1—Sullivan Model HA 3
3—Ingersoll-Rand Model HU

AIR SLUSHER HOISTS
3—Ingersoll-Rand Model A-4NNOJ
1—Ingersoll-Rand Model HNNIJ
1—Sullivan Model FF-211
1—Sullivan Model F-212

ELECTRIC TUGGERS AND SLUSHERS
1—5 HP Sullivan, 2 drum slushers
1—5 HP Sullivan Tugger
2—7½ HP Sullivan tuggers
1—15 HP Ingersoll-Rand size 15NN-IG, 2 drum slushers
1—30 HP Joy Double Drum Slusher
1—60 HP Sullivan 3 Drum Slusher
1—10 HP Sullivan A-312 3 Drum Electric Slusher
1—20 HP Sullivan AF-312 3 Drum Electric Slusher

BALL AND ROD MILLS
1—4' x 4' Marcy Ball Mill
1—4' x 4½' Hirsch Ball Mill
1—64½ Marcy Ball Mill
1—8' x 22" Hardinge Conical Ball Mill
1—3' x 8' Morse New Rod Mill
1—5' x 10' Denver Ball Mill

JAW CRUSHERS
4—2¼" x 3½" New Morse Lab Crushers
3—4" x 6" New Morse Lab Crushers
1—5" x 6" New Morse Jaw Crusher
1—6" x 7½" Hendy Crusher
1—10" x 18" Gruendler Roller Bearing Jaw Crusher.
1—10" x 20" Pacific Crusher
1—20" x 36" Diamond Roller Bearing, Steel Plate, Jaw Crusher

FILTERS
1—3' x 4' Oliver Drum Filter.
1—3' x 5' Oliver Drum Filter.
1—4' x 2' Morse Drum Filter.
1—4' x 8' Eimco Drum Filter.
1—6' x 3' Dorrco Internal Type Filter.
1—6' x 2 disc Oliver Leaf Filter.
1—6' x 5 disc Morse Leaf Filter.

LOCOMOTIVES
1—1½ Ton Mancha "Trammers"
3—5 Ton Atlas Battery Locomotives
2—5 Ton General Electric Battery Locomotives
1—4 Ton Westinghouse Battery Locomotive
1—4 Ton General Electric Trolley Locomotive
1—4 Ton General Electric Battery Locomotive
1—6 Ton Goodman Trolley Locomotive
2—6 Ton Jeffrey Trolley Locomotive
2—6 Ton General Electric Battery Locomotives
1—7 Ton Atlas Battery Locomotive
2—8 Ton General Electric Battery Locomotives
3—8 Ton Ironton Battery Locomotives
1—9 Ton Whitcomb Battery Locomotive
4—10 Ton Atlas Battery Locomotives
2—10 Ton Jeffrey Trolley Locomotives
1—13 Ton Jeffrey Trolley Locomotive
1—13 Ton Goodman Trolley Locomotive
1—15 Ton Jeffrey Trolley Locomotive

FILTER PRESSES
1—24" Shriver
1—36" Merrill
1—36" Sweetland #12
2—4' x 10' Kelly

LABORATORY EQUIPMENT
2—2000 gram Denver flotation cells
2—Stearns-Roger lab batch ball mills
1—15" x 17" lab batch ball mill
1—2" x 6" Sturtevant jaw crusher
5—2¼" x 3½" New Morse lab jaw crushers
3—4" x 6" New Morse lab jaw crushers
3—8" New Morse disc pulverizers
2—6" Iler pulverizers
2—Stearns-Roger lab pressure filters
2—Denver Lab Pressure Filters.

FEEDERS
2—24" Ross chain feeders, Type F, No. 2.
1—30" Challenge feeder.
1—32" Deco Challenge type.
3—18" x 14' belt ore feeders.
1—20" x 60" Alloy feeder screen.
1—10" x 36" Jeffrey Type 2A vibrating feeder.
1—36" x 36" Jeffrey No. 4 vibrating feeder.

FLOTATION MACHINES
1—1 cell Fagergren, 27" dia. type STD.
1—1 cell New Morse "Jetair" #7, 22" x 22" cell.
1—1 cell Fagergren, 36" x 36" cell.
1—2 cell Morse-Weinig, 37" x 37" cells.
1—4 cell Morse-Weinig, #15, 24" x 24" cells.
1—6 cell Stearns-Roger, 31" x 31" cells.
1—4 cell Denver Sub-A, #21, 38" x 44" cells.
1—6 cell Denver Sub-A, #21, 38" x 44" cells.
1—6 cell Fagergren, 36" x 36" cells.
1—2 cell Fagergren, 66" x 66" cells.

WE OWN WHAT WE ADVERTISE—ALL EQUIPMENT IN OUR DENVER STOCK WHERE INSPECTION CAN BE MADE

MORSE BROS. MACHINERY COMPANY

2900 Brighton Blvd. **KEystone 4-5261** **Denver 1, Colorado**

MINING EQUIPMENT SALE

CLASSIFIERS
1—6" x 4'-6" Denver Laboratory, Spiral
1—4' x 15' Dorrco Duplex Rake
1—36" x 12'-8" Denver Spiral

COMPRESSORS
1—2500 cfm Sullivan, Class WN4, 2200 V.
1—600 cfm Gardner Denver Portable
1—315 cfm Ingersoll Rand Portable

CONVEYORS
1—60" x 150' Steel Frame 100 H.P.
1—42" x 1250' Link Belt, 2-100 H.P.
1—42" x 870' Link Belt, 200 H.P.

CRUSHERS
1—15" x 36" Universal, 50 H.P. 440 V.
1—10 x 20 Rogers Jaw Crusher, Roller Bearing
1-10 x 30 Pacific Jaw Crusher, 40 H.P.
1—4 x 6 Massco Lab. 3 H.P.
1—2¼ x 3 Braun Chipmunk, 2 H.P.
1—2⅝ x 4 Braun Chipmunk, 2 H.P.

DIAMOND DRILLS
2—CP8 Chicago Pneumatic Hydraulic Head, V-8 Engine, Complete with Bean Pumps
1—#55 Chicago Pneumatic, Air Powered
2—H8-15 Sullivan, Air Powered

FEEDERS
1—4' x 8' Jeffrey Vibrating, Type 5, 440 V.
1—36" x 8'-4" Link Belt, Apron, 3 H.P.
1—36" x 72" Jeffrey Traylor Grizzly Pan, 440 V.

FILTERS
1—6'-4 disc Eimco Filter Complete
1—6'-5 disc American Filter, Complete

FLOTATION MACHINES
1—6 Cell #21 Denver "Sub A" Flotation
1—1 Cell #100 Denver Unit Cell
1—5 Cell Wemco Size 44" x 44", Excellent

GENERATORS
1—50 KW Caterpillar D 8800, 220/440 V. Excellent
1—75 KW Caterpillar D 13000, 220/440 V. Excellent

HOISTS MINE SHAFT
1—40 H.P. Coeur d'Alene Jr. Single drum, Exc.
1—75 H.P. W. A. Box, Single Drum
1—200 H.P. Coeur d'Alene, Single Drum
1—600 H.P. Vulcan Wilkes Barre, Single Drum, 2300 V.

200 H.P. COUER d'ALENE HOIST

1—600 H.P. Vulcan Wilkes Barre, double drum, 2300 V.
1—675 H.P. Vulcan Wilkes Barre, double drum, 2300 V.

HOISTS, TUGGERS & SLUSHERS
1—AF 312 Joy, 3 drum air, 15 H.P.
4—BKE Gardner Denver, 2 drum air
1—CA 311 Sullivan, 3 drum 50 H.P. 440 V.
2—A5NNOH Ing. Rand, 2 drum, air
1—15 NM2F Ing. Rand, 2 drum, 15 H.P.
1—FF-311 Joy, 3 drum, Elect.
4—HU Ing. Rand Tugger, Air 2000# pull
8—HK Gardner Denver, Air 2000# pull
1—20 NM2C Ingersoll Rand, 2 drum, 440 V.
1—BF-312 Sullivan, 3 drum, 20 H.P. 440 V.
4—30NM3C Ingersoll Rand, 2 drum, 30 H.P. 440 V.
1—CF-211 Sullivan, 2 drum, 50 H.P. 440 V.

HYDROSEPARATORS
1—36' x 10' Process Engineers, Steel tank
2—24' x 8' Process Engineers, Steel Tank

JIGS
14—4 Cell 42" Yuba, M-8, 3 H.P.
1—2 Cell 42" Yuba, Model M-8
3—12" x 18" Denver Duplex
1—42" x 42" Bendalari, Duplex

LOCOMOTIVES
5—1½ Ton Mancha Battery, 18"-24" ga.

GET OUR CATALOGUE & LISTS

1—3½ Ton Mancha AX Battery, 18" ga.
1—4 Ton Mancha "Elec. Mule," Battery, 24" ga. Exc.
1—1½ Ton Atlas, Type J, 24" ga.
1—7 Ton Plymouth Diesel, 18" ga.

MILL
1—5' x 10' Marcy Ball Mill
5—8' x 9' Traylor Ball Mills
1—5' x 8' Traylor Rod Mill
1—3' x 8' Hendy Rod Mill

MUCKERS
5—12B Eimco Mucking Machines, 18" ga.
5—GD9 Gardner Denver, 18" ga.
1—HL3 Sullivan, 18" ga. Bargain

PULVERIZERS
4—Braun UA Laboratory, 440 V.

PUMPS, SAND
2—8" Dorrco Duplex, Type W, 5 H.P.
3—6" Dorrco Duplex, Type VM, 3 H.P.
3—6" x 6" Allis Chalmers, NR LOR, 30 H.P.
10—4" x 6" ASH Hydroseal, Frame B.

SAND WHEEL
4—12½' x 4' Conveyco Duplex, Steel Tank

SCREENS
1—4' x 9' Deister Plato, 1 deck, 7½ H.P.
1—9' x 54½' Yuba Trommel, 100 H.P.
3—4' x 12' Tyler Ty-Rock F600
1—4 x 10' Tyler Hummer 1 deck
1—4' x 8' Symons Rod Deck

SHOVELS
1—7yd. BucyrusErie, 170 B, Electric
1—3½ yd. Marion, 111, with Dragline
1—5 yd. Marion Model 7200 Walking Dragline, Diesel Electric

THICKENERS
1—15' x 8' Denver Rake Thickener, less tank
1—38½' x 8' Denver Spiral Rake, w/steel tank
1—6" x 8" Fairbanks Morse #5814, 2000 gpm, 300 H.P. Regutron Controls.
1—10" Yuba, Model AA, 2400 gpm, 75 H.P.
2—14" Yuba, Model AA, 5500 gpm, 125 H.P. & 250 H.P.
1—16" Wintroath deepwell, 2000 gpm, 100 H.P. Regutron controls.
2—16" Cascade, Sump, Single stage, 7440 gpm, 30 H.P.

SEND FOR OUR LISTINGS

MACHINERY CENTER, INC.

1201 SO. 6TH WEST • HU 4-7601 • SALT LAKE CITY 10, UTAH

1—5'3" Dia. x 10' Face Oliver Continuous Vacuum Precoat Filter—Monel Construction (NEW-UNUSED).

2—18" x 24" Universal Rlr. Brg. Jaw Crushers.

1—3' x 8' Marcy E.P.D. Rod Mill.

1—5' x 9' Kennedy Ball Mill.

1—4-Cell (28x28) D.E. Sub-A Flot. Machine.

1—GD-9 Gardner-Denver Mucker, 18" Ga.

1—GD-10 Gardner-Denver Mucker, 24/18" Ga.

2—No. 12-B Eimco Muckers, 18/24" Ga.

1—No. 21 Eimco Mucker, 24/36" Ga.

1—No. 40-H Eimco Mucker, 36/24" Ga.

1—Ottumwa 1-Drum Hoist, 10,000# Rope Pull, Drum 54" Dia., 20" Face.

1—Vulcan 1-Drum Hoist, 10,000# Rope Pull, Drum 66" Dia., 31" Face.

1—W-S-M 1-Drum Hoist, 10,000# Rope Pull, Drum 60" Dia., 78" Face.

1—Vulcan 1-Drum Hoist, 4500# Rope Pull, Drum 32" Dia., 22" Face.

1—DEWCO 1-Drum Hoist, 5000# Rope Pull, Drum 40" Dia., 23½" Face.

Note: Rope speeds, Motors & Controls to suit conditions of hoisting requirements. Other Hoists available.

MACHINERY RESERVE OF DENVER

730 West 42nd Ave., Denver 16, Colorado

Cable: "Marod" Phone: GL 5-9419

CLOSING OUT

FELDSPAR GRINDING PLANT

MANCHESTER, CONN.

1—Symons 3' shorthead cone crusher, 50 HP
1—Buchanan 13"x24" jaw crusher, 50 HP
2—Hardinge 7'x36" conical pebble mills
13—Abbe 6'x8' pebble mills, 30 HP
1—Allis Chalmers 6'x18' pebble mill

1—Vulcan 10'x11'x'175 long rotary kiln, 13/16" shell, (2) tire
1—Kennedy 7'x9' contin. ball mill.
2—Allis Chalmers 5'x22' tube mills, 150 HP
1—7'x50' Allis-Chalmers rotary dryer, ⅝" shell.
1—7'6" dia. x 62' long rotary kiln, ½" shell.
1—Hardinge 10'x48" conical ball mill, 350 HP.
1—Hardinge 6'x48" conical ball mill, 75 HP.

PERRY EQUIPMENT CORP.

1429 N. 6th St. Phila. 22, Pa.

POplar 3-3505

FEDERAL PIPE & TANK CO.

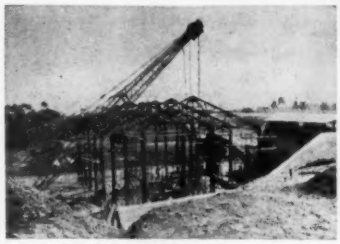
—WOOD PIPE and WOOD TANKS—

Ore Bins
Tailings Pipe

6851 E. Marginal Way
Seattle 8, Wash.

W. R. WADE

CONSULTING MINING ENGINEER



ANOTHER
WADE COPPER MILL
(Now operating)
UNDER CONSTRUCTION
IN
CUBA

30 year experience
Designing and Building
Copper, Lead, Zinc, Gold Mills

W. R. WADE

Marysville, Montana

Cable Wade Helena

Tel. Helena Hickory 2-0105

Mancha: Little Trammers 18/24" ga.
Muckers: Eimco 12-B and 21-B. Late serials
Portable Crushing Plant: Cedar Rpds 20x36 rlr-brg crusher, etc.
Crusher: 10x16 Denver Eq. Co.
Crusher: 15x30 Buchanan Blake Type
Apron Feeder: Pioneer "Oro" 34"x10 ft.
Rod Mill: 4x10 Hardinge periph. and dis.
Ball Mill: 5 ft. dia. x 6 ft. Colo. I. Wks
Classifier: 8x21'8" Dorr DSF duplex rake
Flotation: 6-Cell 56x56 Wemco Fag. v-belt-dr.
Filter: 3-Leaf 6 ft. American w/vac. eq. etc.
Thickener: 28x10 Dorr low-head w/steel tank

Paul F. Smith

39 W. Adams St. Phoenix, Arizona

8' Gayco Air Separator W/Motor
24"x95' Hewitt Robins Belt Conveyor New
2—5'x8' Kennedy Van Saun Air Swept Ball Tube Mills with disc feeders, fans, piping.
4½'x9' KVS Air Swept Ball Mill
2 Wemco 2M—HMS Plants
6'x4' & 6'x8' Traylor Ball Mills
No. 56 and 7'x15' Marcy Ball Mills
10'x48" & 6'x36" Hardinge Ball Mills
4'x11' & 7'x15' Marcy Rod Mills
15"x24" Rogers RB Jaw Crusher
14"x28", 30x36 & 48"x72 Jaw Crushers
78"x36'6" Akins Duplex Spiral Classifier
5'x30' Ruggles Coles Rotary Dryer
8'x60' Rotary Dryer ½" Welded Shell
3'x30', 9'x162' Allis Chalmers Rotary Kilns
8, 12, 23, 25, 45, 60 & 100 ton GE & GM Diesel Electric Locomotives
25 ton Ind. Brn. Hoist Dsl. Loco. Crane
6-2200 & 2078 Ingersoll Rand Elec Compressors

DARIEN, 60 E 42nd Street, N.Y. 17, N.Y.

Sell your used equipment through a Market Place ad

CLASSIFIED ADVERTISING

RATES

Twenty cents per word set in 8-point type, 25 cents a word set in 10-point type. If a box number is used, add $1.50 for cost of handling and forward replies. Add 50% for insertion of notice in WORLD MINING also. $5.00 mininmum charge. Deadline is 5th of month preceding date of issue.

SILICA—World's largest known deposits on five islands which are on the sea lanes to Europe. The Silica may be used for ballast on ships returning empty to Europe. Texture uniform, round grains and fine, cemented by silicious substance. Located on St. Lawrence River below Saguenay River. Average silica content 99.40 percent, maximum iron content 0.26 percent. Most reasonable deal for the right people. John R. Beauchemin, 5916 Esplanade Ave., Montreal, Quebec.

FOR SALE—Mining Engineering and Assay office, established since 1914. Contact Mrs. Ira L. Wright, P. O. Box 231, Phone 538-2457, Silver City, New Mexico.

GRADUATE Mining Engineer, age 34, married, desires production or management position. Nine years experience management, quarrying, construction and exploration. Primary considerations opportunity and responsibility. Will consider any location in U. S. Excellent references. Write Box H-2, Mining World, 500 Howard Street, San Francisco 5, California.

STRATEGIC MICA—Muscovite property located six miles from dock on tidewater. Main dyke minimum 3000 feet long and a minimum of 200 feet wide containing high grade muscovite of the ruby type with about 25 percent both sheet and flake. Principals only. Open for any type of deal. John R. Beauchemin, 5916 Esplanade Avenue, Montreal, Quebec, Canada.

MINING INVESTORS — As ex-Section Chief, Bureau of Mines, Ministry of Mines and Hydrocarbons, Venezuela, with 22 years experience as government official, I offer my services to supply mining information to investors for reasonable fee. Marco Tulio Cuenca, Director, Tercer Piso, No. 8, Avenida y Edificio La Estrella, San Bernardino, Caracas, Venezuela.

DOLOMITE deposit wanted within 200 miles of San Francisco. Should be large, amenable to mining with power shovel and high in magnesite content, preferably 40 to 45% $MgCO_3$. Should be low in ferric oxide content. Send details. P. O. Box 435, Happy Camp, California.

Index of Advertisers In Mining World

**Asterisk indicates firms whose products are catalogued in* MINING WORLD's *1960 Catalog, Survey & Directory Number*

SKYHOOK

for "No-Crane" Areas

With 6 ft. of height adjustment, and a wheel tread adjustment to the narrowest aisles, the result is a new concept in portable gantries. Also featured is an I-Beam that hangs freely from hinged supports, eliminating internal twist and strain regardless of how uneven the floor may be. The trolley is free to travel the full length of the beam.

The legs fold against the I-Beam, resulting in a compact unit for hauling or storage. Models are available with steel or aluminum alloy I-Beams in heights up to 17 ft. and 30 ft. spans. Maximum capacity is 4 tons. For complete literature write

B. E. WALLACE PROD. CORP.

EXTON BB, PA.

WORLDWIDE PROFESSIONAL DIRECTORY

COOKE, EVERETT & ASSOCIATES
CONSULTING GEOLOGISTS
Examinations—Exploration—Research
Photogeology—Valuations—Surveys
P. O. Box 2229 Reno, Nevada, U. S. A.
Telephone: FAirview 9-1766
Cable Address: COVER

ABBOT A. HANKS, INC.
ESTABLISHED 1866
ASSAYERS—CHEMISTS—ENGINEERS
Supervision of Sampling at Smelters and Shipping Points
Control and Umpire Assays
SPECTROGRAPHIC ANALYSIS
Inspection and Tests of Structural Materials
1300 Sansome Street SAN FRANCISCO 11
Telephone EX 7-2464 Cable Address: HANX

E. J. LONGYEAR CO.
Geological and Mining Consultants
Photogeology
76 South 8th Street ..... Minneapolis, Minn.
Graybar Bldg. ..... New York 17, N. Y.
Colorado Bldg. ..... Denver 2, Colo.
Shoreham Bldg. ..... Wash. 5, D. C.
129 Ave. de Champs-Elysees ..... Paris, France

HARRY B. CANNON ASSOCIATES
Geologists — Engineers
Exploration Ore Dressing
Specialists in Heavy Minerals
P.O. Box 2432 Lakeland, Florida

GEORGE H. NEWMAN
Consulting Geologist
Registered Mining Engineer
Specialist in the Philippines
P.O. Box 2418 Manila, Philippines

CLASSIFIED ADVERTISING

FOR SALE—Gold Mining Dredge complete with accessories, lighting plant, 10" pump, and 65-HP GMC diesel motor. Location Nevada. Compactness permits ready shipment. Price $20,000. For purchase or additional information write attention I. R. Lunt, Rogers Engineering Co., Inc., 16 Beale Street, San Francisco 5, California.

LARGE Vermiculite deposit for sale. 500 acres. 18 miles from railroad. Box 132, Hamilton, Montana.

DIVER—Graduating school commercial deep sea diving. Work world wide. Contact Richard Miller, 193 Monteceito, Oakland, California, U. S. A.

FOR LEASE—For small fee. 50 acres (surveyed) Mohave Desert land. Location in Section 16 in San Bernardino County, California. For Mineral explorations. Write Box 186, LaVerne, California.

CORE DRILLS, Auger Drills, Hand Soil Testing Drills, Well Drills. New and used equipment at money saving prices. Everything in supplies. Send for bulletins. Pressey & Son, Pueblo, Colo.

Watch for your copy of the October Pre-Convention Issue of Mining World All about the big AMC Las Vegas Mining Show

EFFICIENT...

WILLISON COUPLERS

The Willison has only four moving parts.

SAFE...

WILLISON COUPLERS

No need for men to go between cars to couple or uncouple.

STRONG...

WILLISON COUPLERS

Coupler head and shank are one-piece steel casting with over 400,000 pound ultimate strength.

VERSATILE...

WILLISON COUPLERS

Used on all types of mine cars and locomotives; with accessories, can couple with link-and-pin hitchings; can be used with cables on incline haulage or odd pulling requirements.

PROVEN...

WILLISON COUPLERS

Over 100,000 Willisons in service in the U.S. and overseas.

- Rubber Cushioned Units
- Mine and Industrial Car Trucks
- NACO Steel Wheels
- NACO Steel Links and Swivel Hitchings

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Established 1868

Transportation Products Division
Cleveland 6, Ohio

International Division Headquarters
Cleveland 6, Ohio

Canadian Subsidiary
National Malleable & Steel Castings
Company of Canada, Ltd., Toronto 1, Ontario

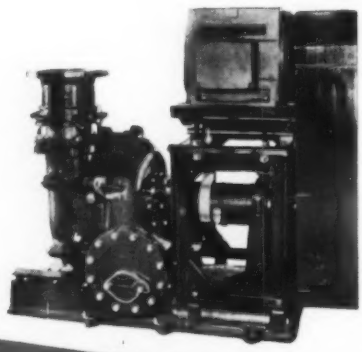
WILFLEY

SAND PUMPS

"True PUMPING ECONOMY Starts After You Buy a Pump!"

Price alone does not determine the actual value of a pump. Quality, efficiency, never-failing dependability . . . these are the prime factors a pump **must** have to give you **true** pumping economy. They pay off in low operating costs month after month, year after year.

WILFLEY SAND PUMPS guarantee true pumping economy through CONTINUOUS, MAINTENANCE-FREE SERVICE, LONGER PUMP LIFE, QUICK, EASY REPLACEMENT of PARTS, and MAINTAINED HIGH EFFICIENCY.



Wilfley Sand Pumps may be fitted with interchangeable electric furnace alloy iron, special application alloys or rubber-covered wear parts. Write, wire or phone for complete details.

Every Wilfley Installation Is JOB ENGINEERED

Wilfley Sand Pumps
"Companions in Economical Operation"
Wilfley Acid Pumps

A. R. WILFLEY AND SONS, INC.

Denver, Colorado, U.S.A. P.O. Box 2330
New York Office: 122 East 42nd Street, New York City 17, N.Y.